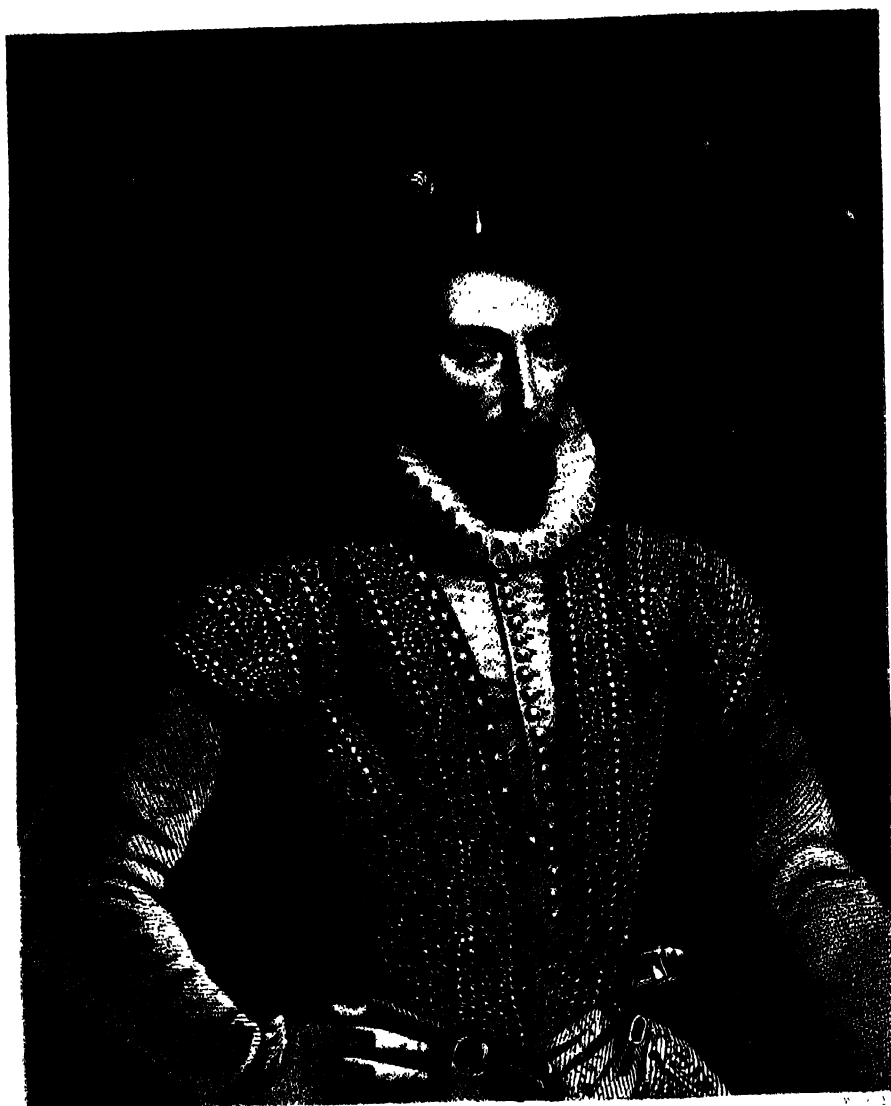


W Ralegh

THE

ILLUSTRATED

GLOBE ENCYCLOPÆDIA

OF

UNIVERSAL INFORMATION.

EDITED BY

JOHN M. ROSS, LL.D.

SENIOR MASTER OF ENGLISH LANGUAGE AND LITERATURE, HIGH SCHOOL OF EDINBURGH.

VOL. VI.

SHEN—ZYMO.

A. FULLARTON & CO.

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1881.

NOTE BY THE EDITOR.

ON the publication of the Sixth and concluding Volume of the 'Globe Encyclopædia,' the Editor may perhaps be permitted to say a parting word. Begun at the close of 1874, the preparation of the work has thus occupied a period of four years and a half. Considering its size and character, the opinion may be ventured that time has not been wasted in putting it before the public in a complete form. It may even be asserted, without fear of challenge, that no English Encyclopædia professing the same fresh, thorough, and independent treatment of topics has ever been executed with equal rapidity. The scale on which the 'Globe' was planned has been carefully adhered to throughout, and the Editor has been fortunate enough to finish the work in the exact limits originally indicated. In other and more important points it is hoped that the promises made in the Preface to Volume I. have been honourably kept. The generous reception accorded to the 'Globe' on its first appearance by the press of Great Britain and the United States made it a real pleasure to the Editor and his staff, not merely to maintain but to improve the quality of the Encyclopædia as it proceeded; and the character of the criticism upon the successive volumes seems to show that they have succeeded in their effort.

It may here be proper to state that the articles in the various departments of the Encyclopædia have been contributed by writers familiar with the latest results of learned research, scientific investigation, and literary culture. The most superficial examination of the contents will disclose to competent judges unmistakeable evidence of adequate knowledge. No trouble or expense has been spared to make the 'Globe' in this respect unrivalled among works of its kind. Articles have been sent to the remotest parts of the Empire for revision, when recent information was not to be had at home; and experts in other countries have given the benefit of their help.

The Editor cannot conclude without the most grateful acknowledgment of the services rendered by his staff of assistants, to whose cordial co-operation the Encyclopædia is largely indebted for what merit it may possess.

J. M. ROSS.

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SIME, WILLIAM, University of Edinburgh.
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IN

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	* Drawn by	Engraved by	In Volume
1. BURNS, ROBERT*	Nasmyth,	W. Holl,	2
2. BYRON, LORD *	C. Saunders,	W. Holl,	1
3. CALVIN, JOHN	C. Dankertz,	W. Holl,	4
4. CLYDE, LORD	H. W. Phillips,	W. Holl,	5
5. CROMWELL, OLIVER *	Original Painting,	W. Holl,	5
6. FRANKLIN, BENJAMIN *	M. Chamberlin,	S. Freeman,	4
7 JOHNSON, SAMUEL	Original Painting,	W. Holl,	1
8. KNOX, JOHN *	Hondius, 1602,	W. Holl,	4
9. LOUIS XIV.,	Original Painting,	W. Holl,	1
10. LOYALA, IGNATIUS DE	Weirix,	W. Holl,	3
11. LUTHER, MARTIN	Holbein.	W. Holl,	3
12. MILTON, JOHN	Original Painting,	W. Holl,	2
13. NAPOLEON,*	Delaroche,	S. Freeman,	1
14. NELSON, LORD *	F. S. Abbot,	S. Freeman,	2
15. RALEIGH, SIR WALTER *	Original Painting,	W. Holl,	6
16. RICHELIEU, CARDINAL	Original Painting,	W. Holl,	1
17. SCOTT, SIR WALTER *	G. S. Newton,	J. B. Bird,	6
18. SHAKESPERE, WILLIAM *	Original Painting,	W. Holl,	2
19. SHERIDAN, RICHARD B.*	Original Painting,	W. Holl,	5
20. STAËL, MADAME DE	Gerrard,	E. Finden,	5
21. SWEDENBORG, EMANUEL	Original Painting,	W. Holl,	3
22. TALLEYRAND, C. M. de	Gerrard,	S. Freeman,	5
23. VOLTAIRE, F. M. A.	Original Painting,	Bosselman.	6
24. WASHINGTON, GEORGE *	Stuart,	S. Freeman,	4
25. WELLINGTON, DUKE OF *	Sir T. Lawrence,	R. Young,	3
26. WICKLIFFE, JOHN	Original Painting,	W. Holl,	6

VIEWS AND MISCELLANEOUS SUBJECTS.

27. AREOPAGUS OR MARS HILL, THE	C. Stanfield,	E. Finden,	6
28. BALMORAL CASTLE,	Sam Bough,	W. Forrest,	1
29. CAPE TOWN FROM TABLE BAY,	A. Nicholl,	R. Young,	3
30. DUBLIN BAY AND KINGSTOWN HARBOUR,	A. Nicholl,	W. Forrest,	4

NOTE.—*Portraits marked thus * have Autographs.*

VIEWS AND MISCELLANEOUS SUBJECTS—(*Continued*).

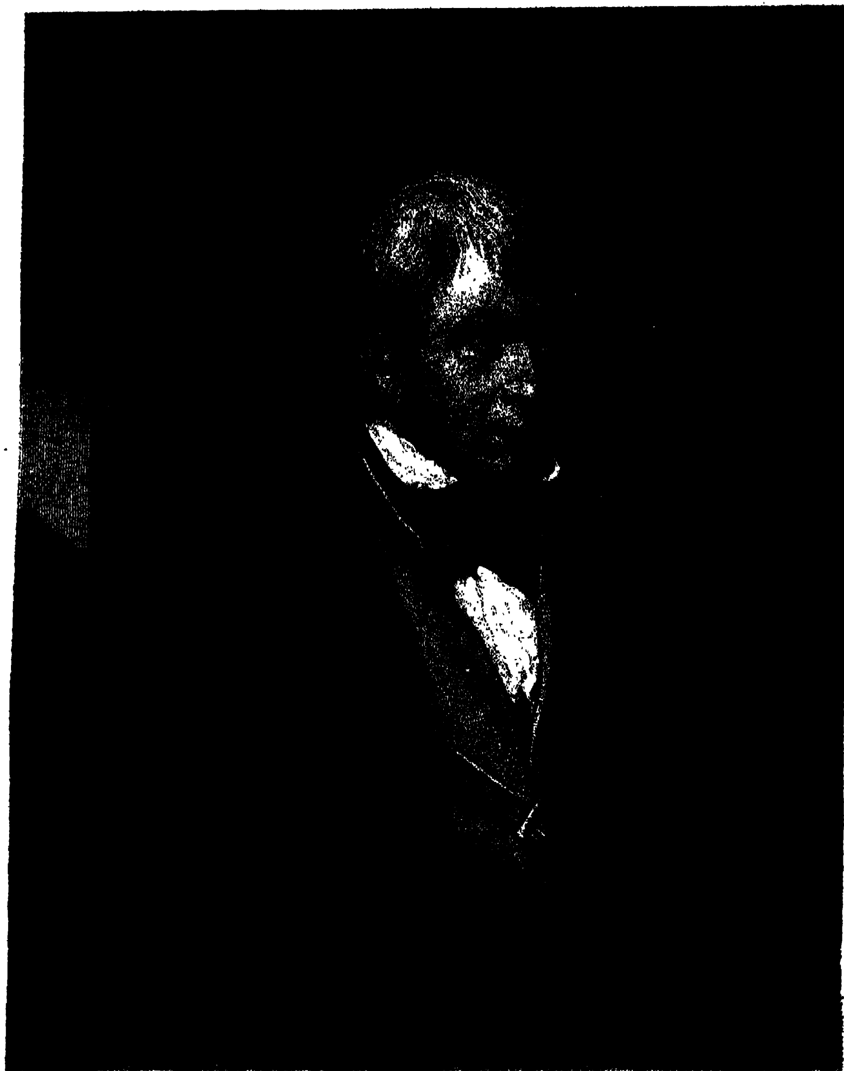
ILLUSTRATIONS OF SCENERY AND ANIMATED LIFE, GENERAL SUBJECTS, AND NATURAL HISTORY.

ILLUSTRATIONS OF SCENERY—(*Continued*).

GENERAL MAPS. (FOLIO SIZE.)

PLANS OF CITIES, &c. (QUARTO SIZE.)

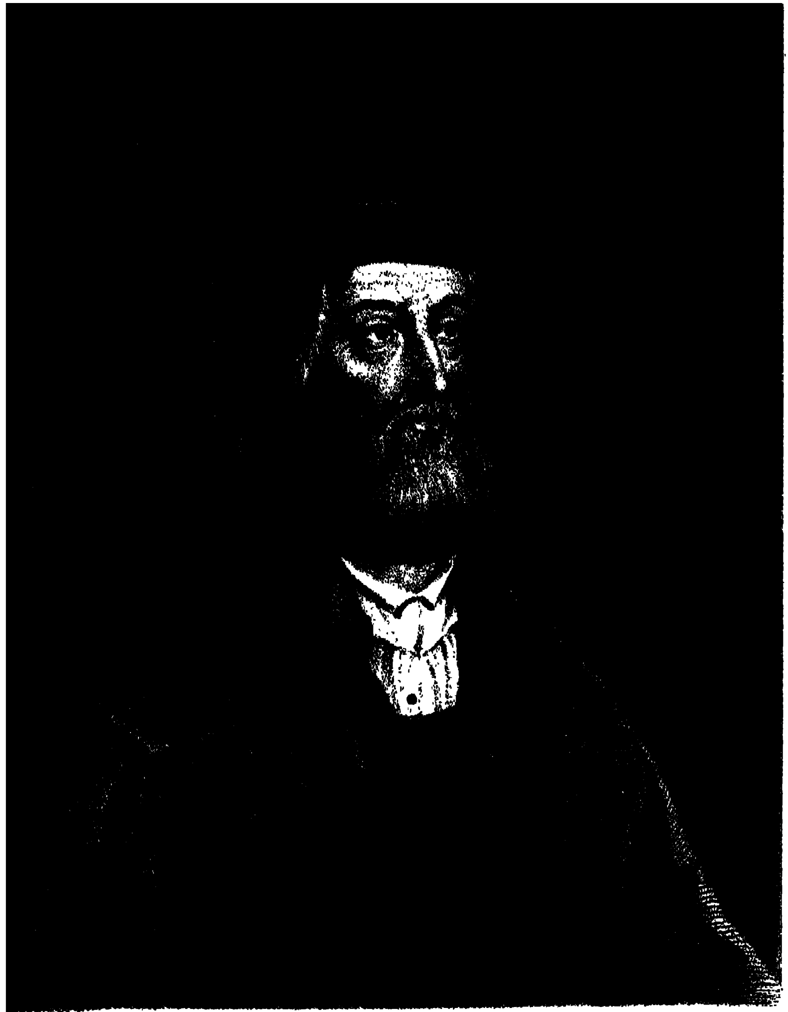
PLANS, VARIOUS. (PAGE SIZE.)



SIR WALTER SCOTT

Walter Scott







THE AREOPAGUS OR MARS HILL.

D O Hill

KILLIECRANKIE.

A. Fullarton & Co. London & Edinburgh.

AUTOGRAPHS OF EMINENT PERSONS REFERRED TO IN THE ENCYCLOPÆDIA.

PLATE IX.

1 Charles Napier
2 Napier of Magdala
3 W Napier

4 Napoléon
5 Francis W. Newman.
6 Isaac Newton

7 F. Nightingale
8 Stafford H. Northcote
9 Daniel O'Connell

10 Richard Owen
11 Palmerston
12 Selborne

13 Wm Penn
[illegible]
14 [illegible]

16 W Pitt 1784
17 A. Pope.
19 Prim

20 M Prior
18 Nicolo Poussin
21 B W Procter.

22 Rachel
23 Racine
24 Allan Ramsay

1 Napier, Admiral Sir Charles. Admiral
2 Napier, Sir William Francis P. Soldier
3 Napier of Magdala, Lord. Soldier
4 Napoleon III. Emperor
5 Newman, Francis William. Author
6 Newton, Sir Isaac. Mathematician &c.
7 Nightingale, Florence. Nurse
8 Northcote, Sir Stafford Henry. Statesman
9 O'Connell, Daniel. Orator
10 Owen, Richard, [illegible] Naturalist & Physiologist
11 Palmerston, Viscount, Henry John Temple. Statesman
12 Palmer, Roundell, Lord [illegible]
13 Penn, William. [illegible]
14 Peter I. (Peter the Great). Emperor
15 Philip II. King of Spain
16 Pitt, William. Statesman
17 Pope, Alexander. Poet
18 Poussin, Nicolas. Painter
19 Prim, Juan. Soldier & Politician
20 Prior, Matthew. Poet
21 Procter, Bryan Waller. Barrister & Poet
22 Rachel, Elizabeth Rachel Felix. Actress
23 Racine, Jean. Dramatist.
24 Ramsay, Allan. Poet.

J. Bartholomew, Lith.

[illegible] W. & A. K. Johnston, Edinburgh.

AUTOGRAPHS OF EMINENT PERSONS REFERRED TO IN THE ENCYCLOPÆDIA.

PLATE X

1 Ramsay, Edward Bannerman Burnett *Dean*
2 Rawlinson Sir Henry *Oriental Scholar*
3 Ray, John *Natural Philosopher*
4 Rembrandt Van Ryn *Painter & Engraver*
5 Reynolds, Sir Joshua *Portrait Painter*
6 Richard II *King of England*
7 Richard III *King of England*
8 Richardson, Samuel *Novelist*
9 Roberts, David *Painter*
10 Robespierre, Maximilien Marie Isidore *Revolutionist*
11 Rogers, Samuel *Poet*
12 Rossini, Gioacchino *Musical Composer*
13 Rousseau, Jean Jacques *Author*
14 Rowe, Nicholas *Dramatist*
15 Rubens, Sir Peter Paul *Painter*
16 Rupert, Prince of Bavaria *Soldier*
17 Russell, John, Earl *Statesman*
18 Sala, George Augustus Henry *Author*
19 Salisbury, Third Marquis of (1879) *Statesman*
20 Sancroft, William *Prelate*
21 Scaliger, Julius Caesar *Scholar*
22 Schiller, Johann Christoph Friedrich von *Poet*
23 Selden, John *Scholar*
24 Shaftesbury, First Earl of *Statesman*

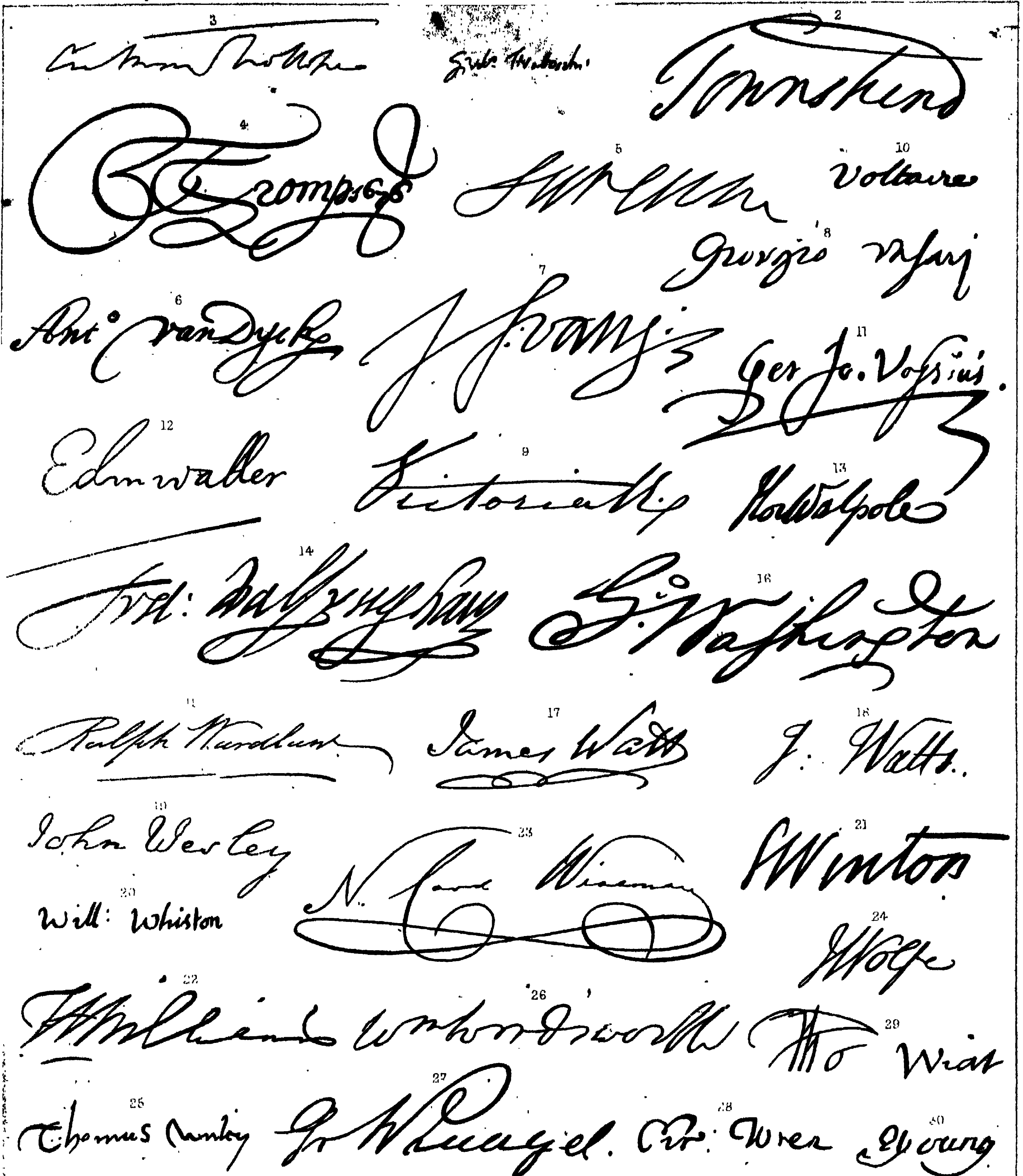
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AUTOGRAPHS OF EMINENT PERSONS REFERRED TO IN THE ENCYCLOPÆDIA.

PLATE XI

1	Shaftesbury, Anthony Ashley Cooper, 7th Earl of, *Philanthropist*
2	Siddons, Sarah, *Actress*
3	Sidney, Sir Philip, *Poet*
4	Sinclair, Catherine, *Philanthropist*
5	Smith, Horace, *Popular Writer*
6	Smollett, Tobias, *Author*
7	Sothern, Edward Askew, *Comedian*
8	Southey, Robert, *Poet*
9	Spenser, Edmund, *Poet*
10	Spurgeon, Charles Haddon, *[illegible]*
11	Stanley, Arthur Penrhyn, *[illegible]*
12	Steele, Sir Richard, *[illegible] Writer*
13	Steevens, George, *English Critic*
14	Sterne, Laurence, *Author*
15	Stewart, Charles Edward, *Prince Pretender*
16	Strafford, Thomas Wentworth, Earl of, *Statesman*
17	Stratford de Redcliffe, Viscount, K.G., *[illegible]*
18	Strickland, Agnes, *Popular Writer*
19	Suckling, Sir John, *Poet & Cavalier*
20	Swift, Jonathan, *Author*
21	Talbot, John, Earl of Shrewsbury, *[illegible]*
22	Tannahill, Robert, *Poet*
23	Tasso, Torquato, *Poet*
24	Taylor, Isaac, *Author*
25	Taylor, Tom, *[illegible]*
26	Tennyson, Alfred, *Poet*
27	Thiers, Louis Adolphe, *[illegible]*
28	Thomson, James, *Poet*
29	Thurlow, Edward, Lord, *Lawyer*
30	Tyndall, John, D.C.L., LL.D., *[illegible]*

[illegible]



1 Tiraboschi, Girolamo *Italian Writer*
2 Townshend, Charles, Viscount *Statesman*
3 Trollope, Anthony *Novelist*
4 Tromp, Cornelius Van *Admiral*
5 Turenne, Henri de la Tour d'Auvergne *Soldier*
6 Vandyck, Sir Anthony *Painter*
7 Vane, Sir Henry *Politician.*
8 Vasari, Giorgio *Author & Painter.*
9 Victoria, Alexandrina *Queen of Great Britain &c*
10 Voltaire, François-Marie Arouet *Author*
11 Vossius, Gerhard Johann *Scholar*
12 Waller, Edmund *Poet*
13 Walpole, Horace *Popular Writer*
14 Walsingham, Sir Francis *Diplomatist.*
15 Wardlaw, Ralph *Divine & Writer*
16 Washington, George *First President of the U S*
17 Watt, James *Steam Engineer*
18 Watts, Isaac *Divine*
19 Wesley, John *Divine & Writer.*
20 Whiston, William *Theological Writer.*
21 Wilberforce, Samuel (as Bishop of Winchester) *Bishop*
22 Williams, Sir William Fenwick *Soldier.*
23 Wiseman, Nicholas Patrick Stephen *Cardinal*
24 Wolfe, James *Soldier*
25 Wolsey, Thomas *Statesman & Cardinal*
26 Wordsworth, William *Poet*
27 Wrangel, Friedrich H E Graf von *Soldier*
28 Wren, Sir Christopher *Architect*
29 Wyatt, Sir Thomas, the elder *Poet*
30 Young, Edward *Poet*

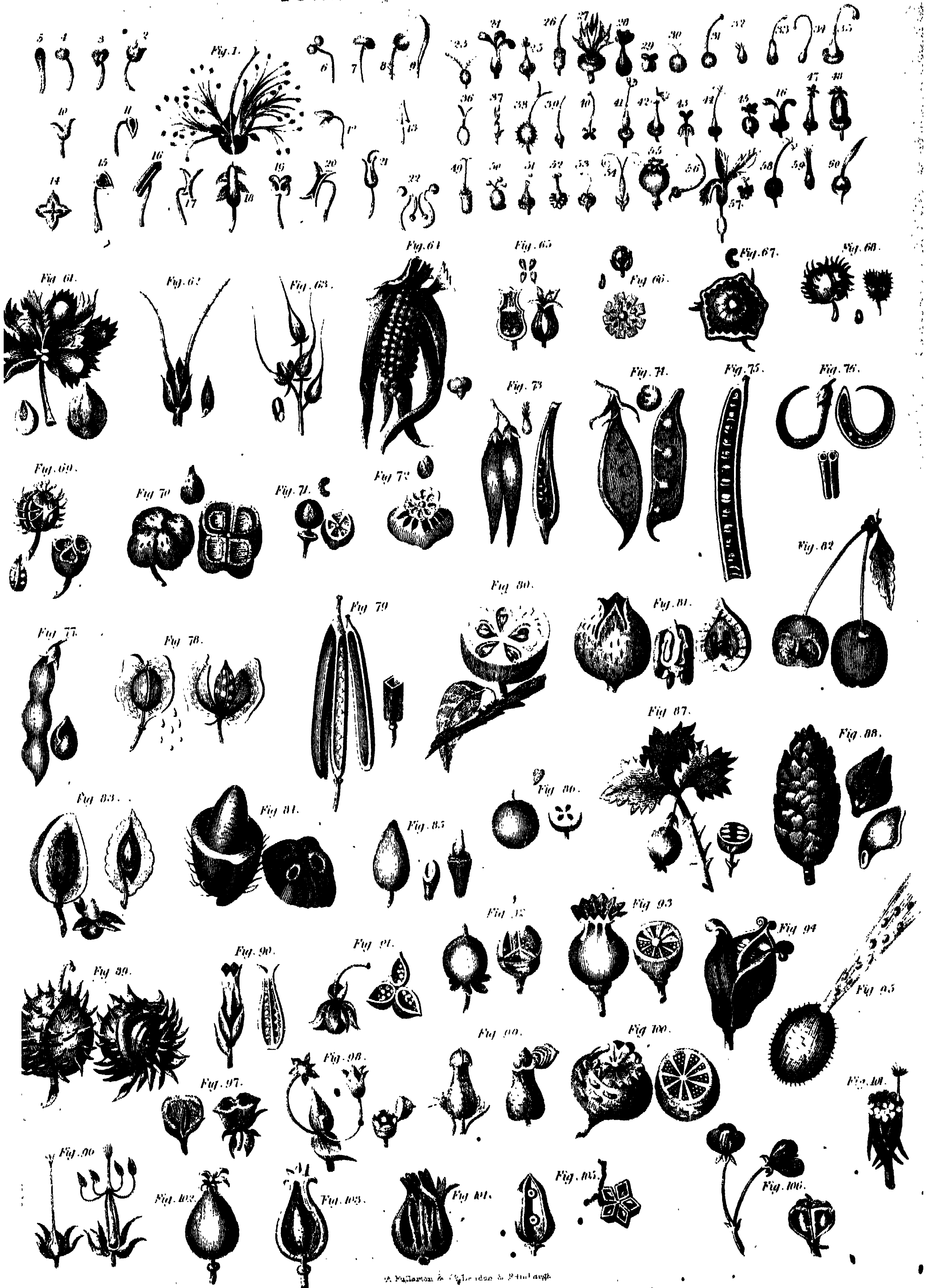
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BOTANICAL TERMINOLOGY IV.



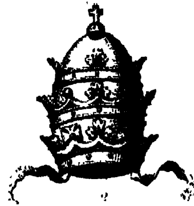
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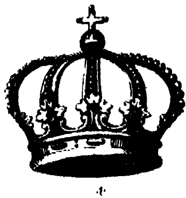
HERALDRY IV.

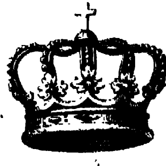
FOREIGN CROWNS

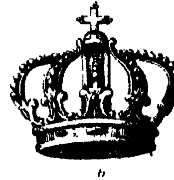

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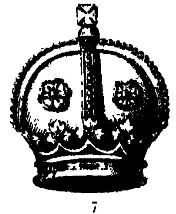

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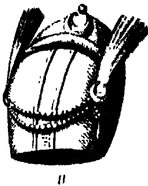

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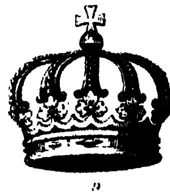

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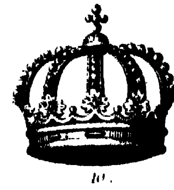

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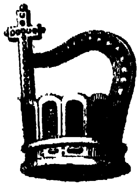

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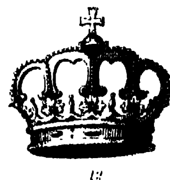

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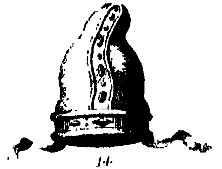

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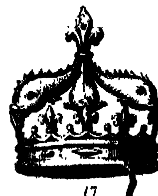

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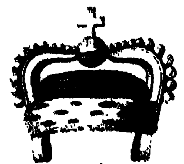

14

1 IMPERIAL FRENCH	7 RUSSIA	13 GRAND DUKE OF TUSCANY
2 POPE	8 GRAND SEIGNOR	14 DOGE OF VENICE
3 FRANCE	9 PRUSSIA	15 ARCH DUKE
4 SPAIN	10 POLAND	16 BRUNSWICK
5 PORTUGAL	11 CHARLEMAIN	17 DAUPHIN
6 DENMARK	12 CORSICA	18 ELECTORAL


15


16

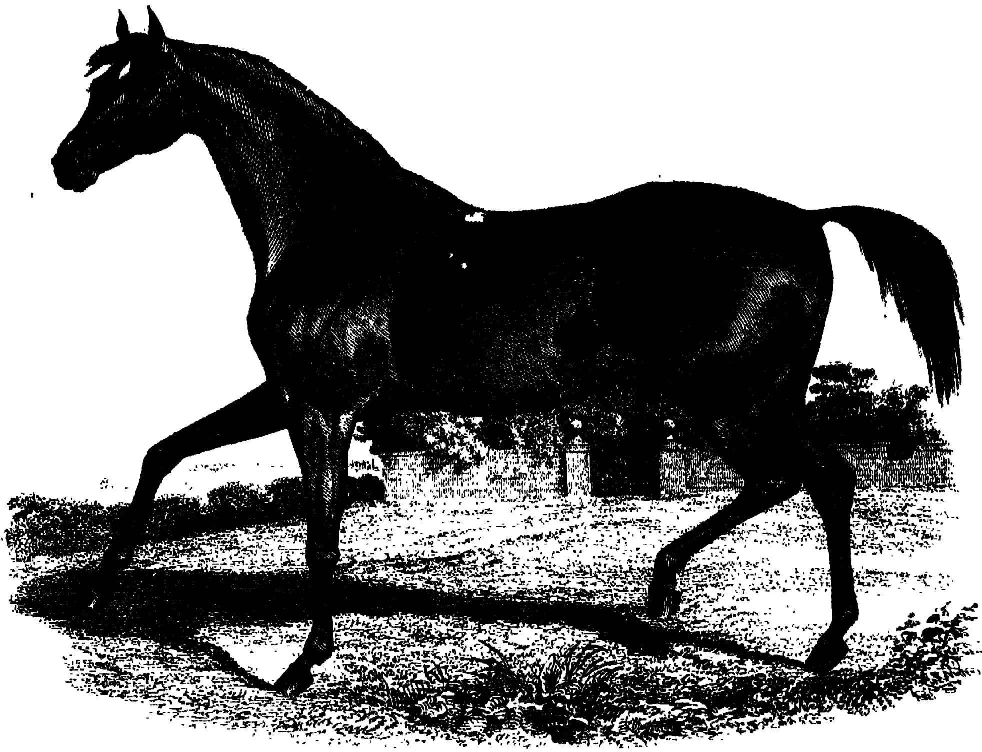

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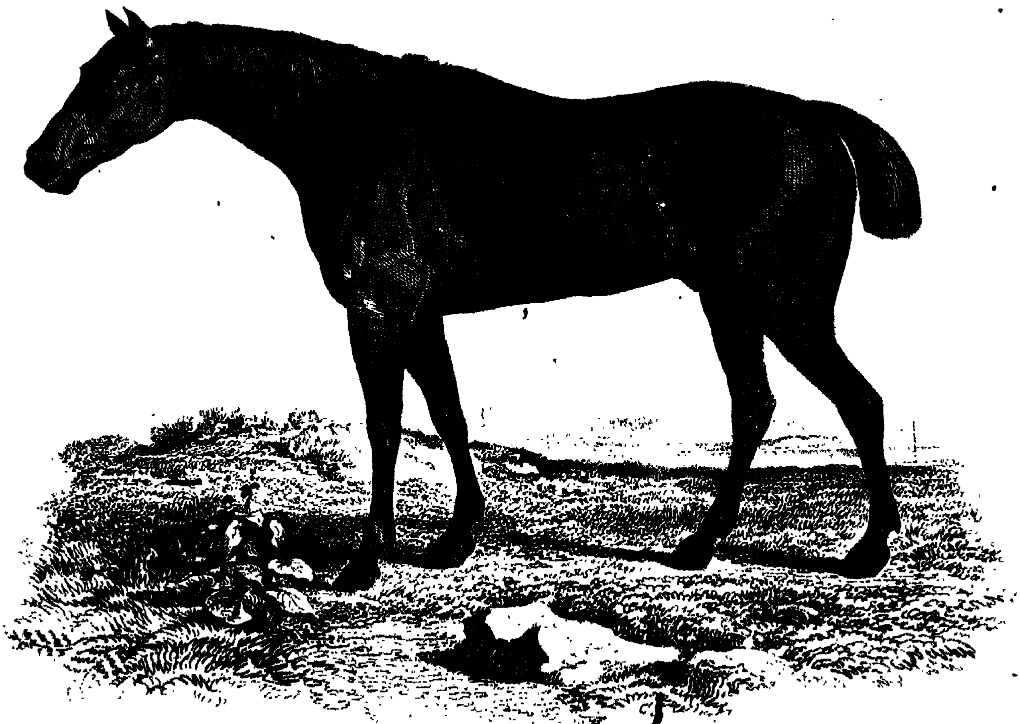

18

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NATURAL HISTORY, XI

RACE HORSES

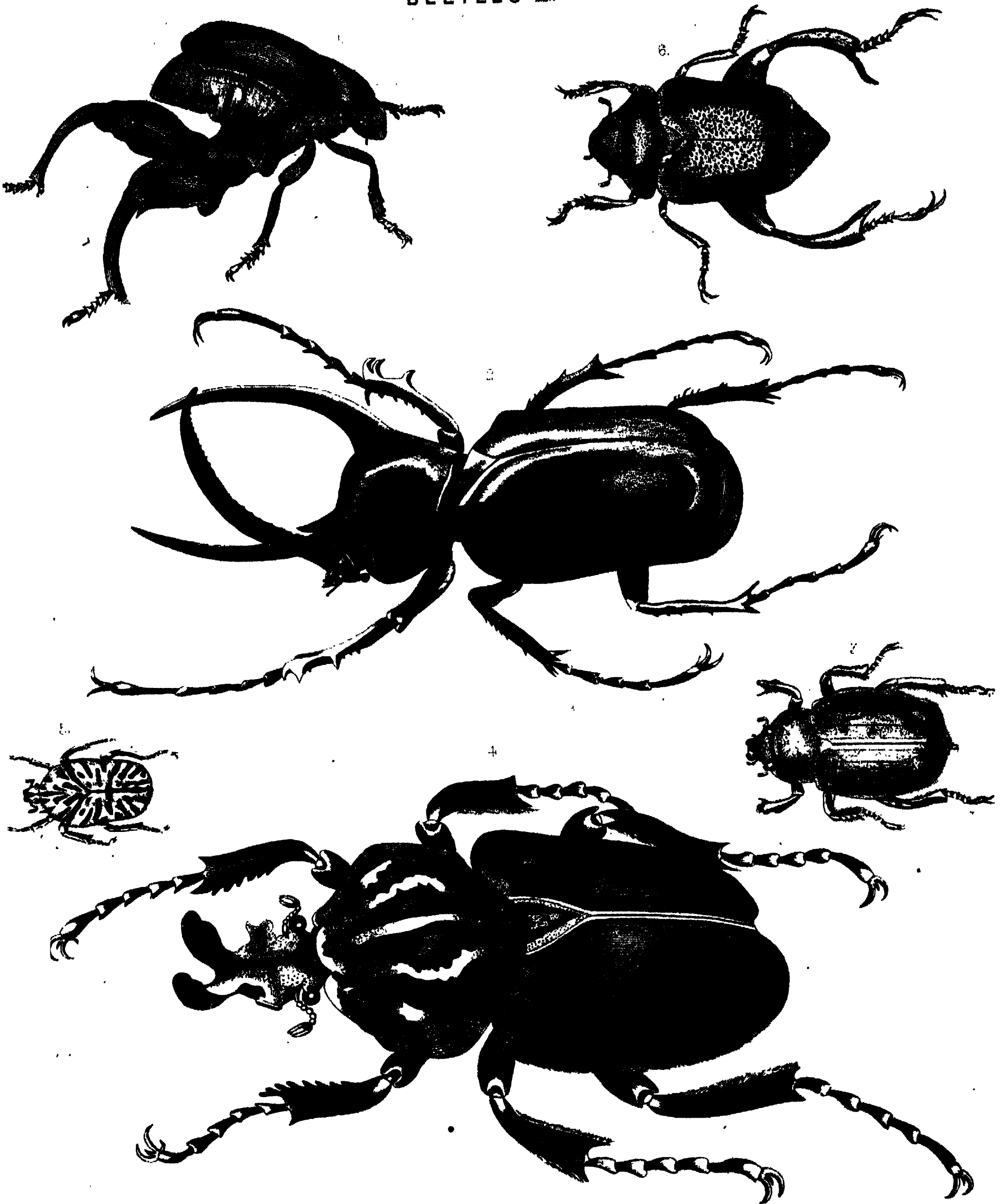




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NATURAL HISTORY XII.

BEETLES II.



1. Kangaroo Beetle 2. Atlas Beetle 3. Peruvian Beetle 4. Goliath Beetle 5. Hieroglyphic Beetle 6. Golden Beetle

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SCENERY AND ANIMATED LIFE

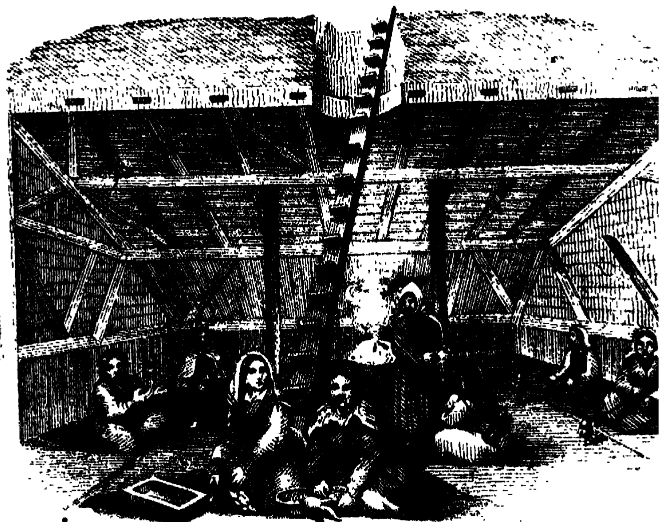
KAMTCHATKA



POST CONVEYANCE, KAMTCHATKA



A BALAGAN OR SUMMER HUT



A YOURT OR WINTER HUT

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SCENERY AND ANIMATED LIFE

KAMTCHATKA AND KIRGHIZ STEPPES





KIRGHIZ FEMALES



KIRGHIZ KAZAK



KIRGHIZ HUNTING WITH THE FALCON

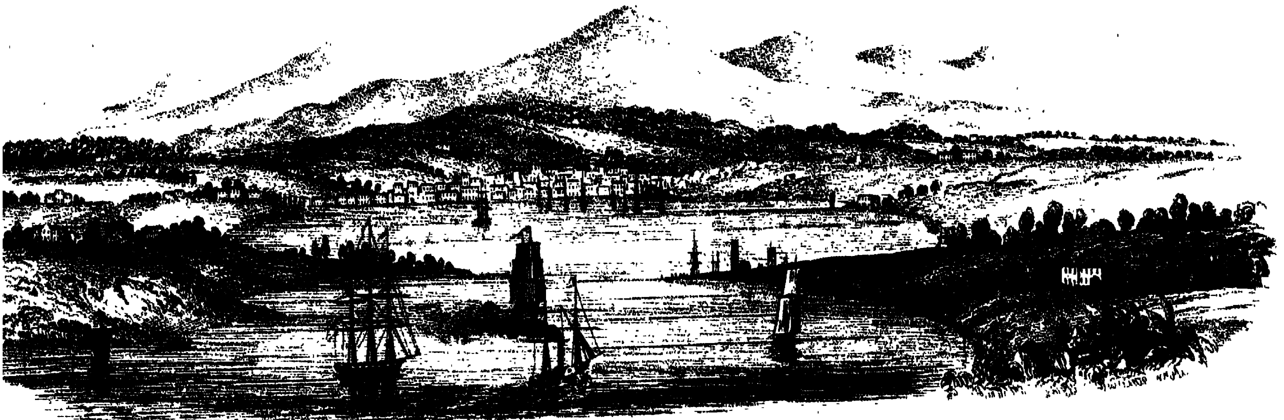


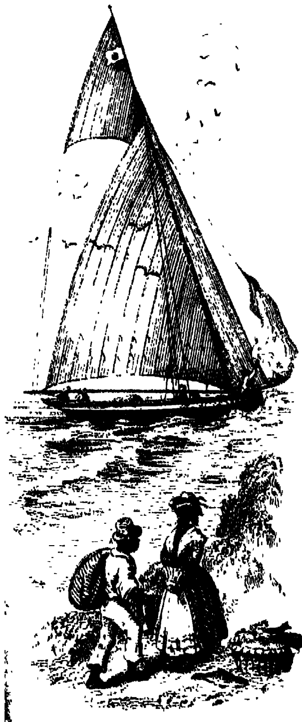
PETROPAULOVSKI

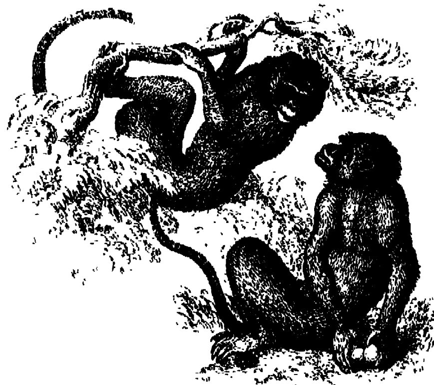
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SCENERY AND ANIMATED LIFE

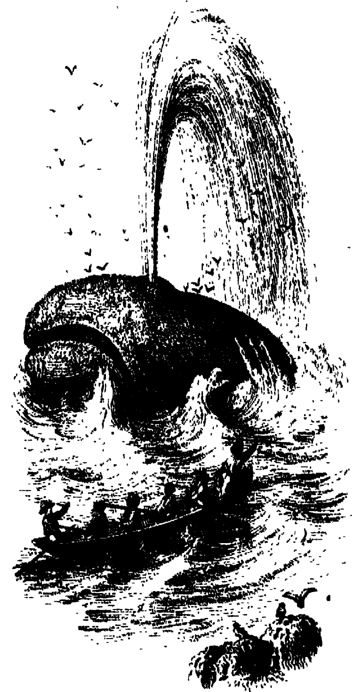
WEST INDIES I.

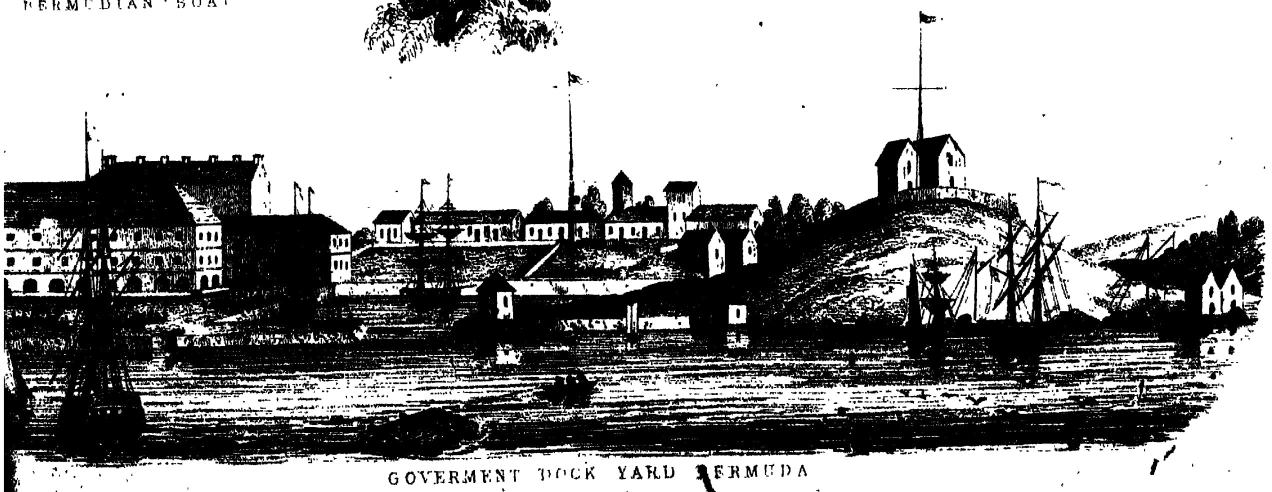

PORT ROYAL HARBOUR JAMAICA


BERMUDIAN BOAT


SQUIRREL MONKEYS


RACOONS


SPERM WHALE FISHING


GOVERMENT DOCK YARD BERMUDA

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SCENERY AND ANIMATED LIFE

WEST INDIES II.



PLANTER & NEGRO



SUGAR MILL



MULATTO & NEGRESS



SUGAR CANE CUTTING



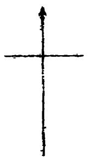
THE SUGAR CANE
IN ITS DIFFERENT STAGES



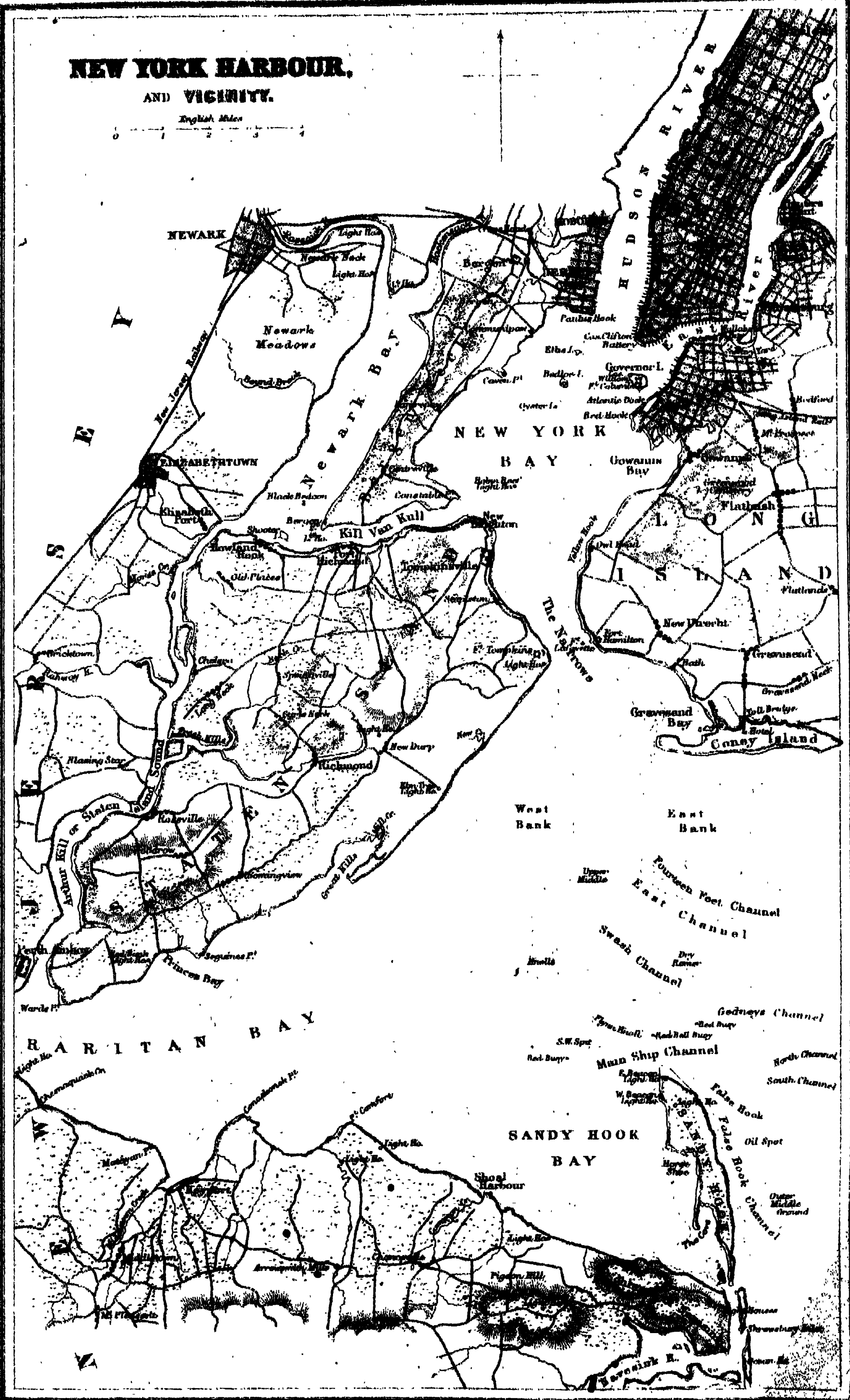
PLANTATION OF COCOA & COFFEE



COFFEE GATHERING



A. Fullarton & C° London & Edinburgh.

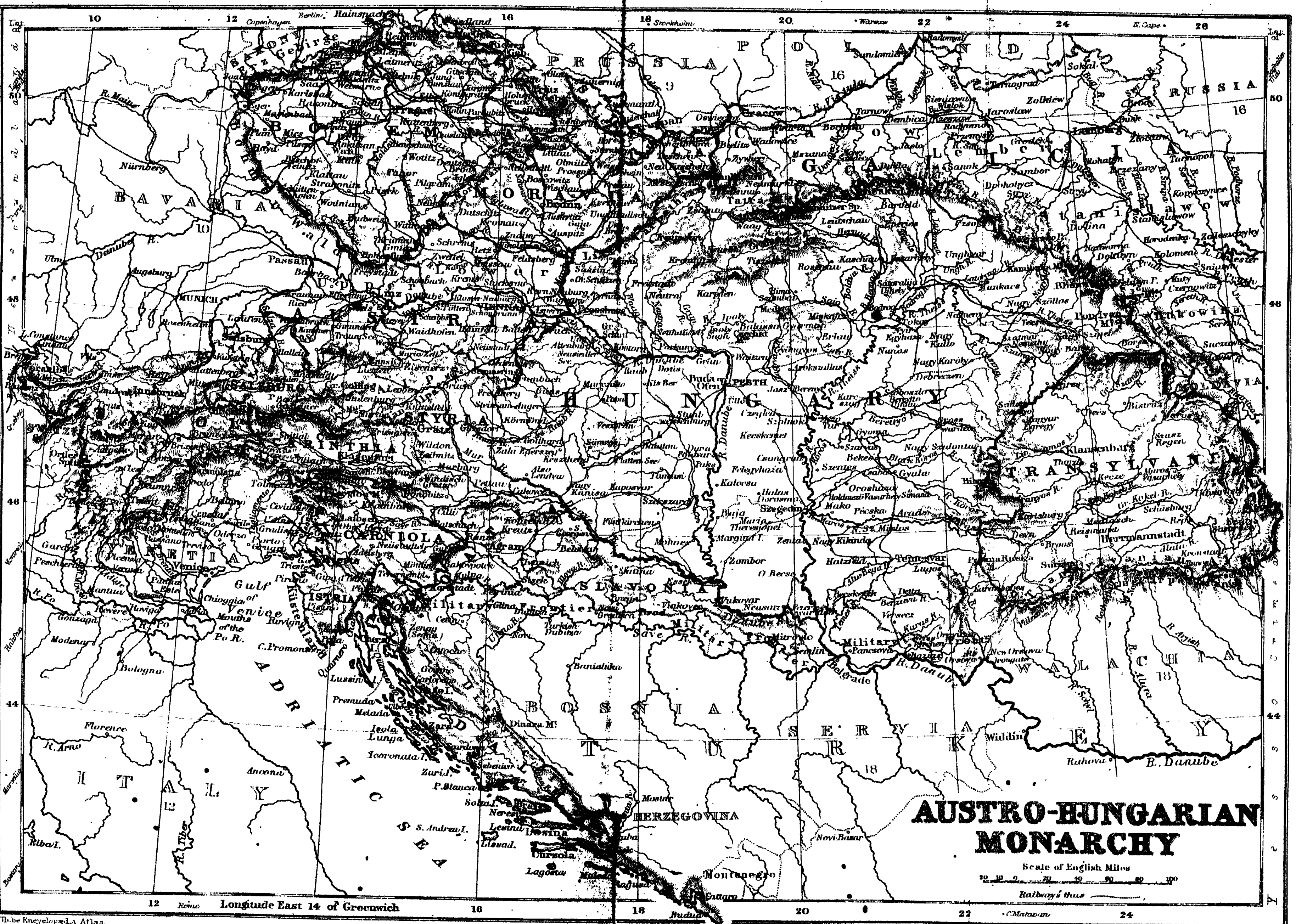


A Fullarton & C^o. London & Edinburgh

NORWICH

Scale of ½ Mile

A Fullarton & Cº. London & Edinburgh


AUSTRO-HUNGARIAN
MONARCHY
Scale of English Miles
Railways thus
Longitude East 14 of Greenwich
BOHEMIA
MORAVIA
GALICIA
BUKOWINA
HUNGARY
TRANSYLVANIA
STYRIA
CARINTHIA
CARNIOLA
SLAVONIA
ISTRIA
Küstenland
VENETIA
DALMATIA
BOSNIA
HERZEGOVINA
SERVIA
TURKEY
WALACHIA
MOLDAVIA
BAVARIA
PRUSSIA
POLAND
RUSSIA
ITALY
ADRIATIC SEA
Gulf of Venice
Vienna
Pesth
Buda
Prague
Lemberg
Cracow
Trieste
Venice
Belgrade
Montenegro
Munich
R. Danube
Globe Encyclopædia Atlas.
W. & A. K. Johnston Edinburgh and London

GERMAN EMPIRE
HOLLAND & BELGIUM.

BY J BARTHOLOMEW, F R G S

British Statute Miles, 69·16 = 1 Deg.

German Geographical Miles, 15 = 1 Deg.

NORTH SEA

BALTIC SEA

SWEDEN

DENMARK

ENGLAND

Gulf of Danzig

Pomeranian Bay

KIEL BAY

East Frisian Islands

ZUYDER ZEE

MECKLENBURG

PRUSSIA

POLAND

(VISTULA PROVINCES)

RUSSIA

Galicia

Bohemia

Moravia

AUSTRIA

Lower Austria

Upper Austria

Styria

Tyrol

SWITZERLAND

FRANCE

WIRTEMBERG

Upper Palatinate

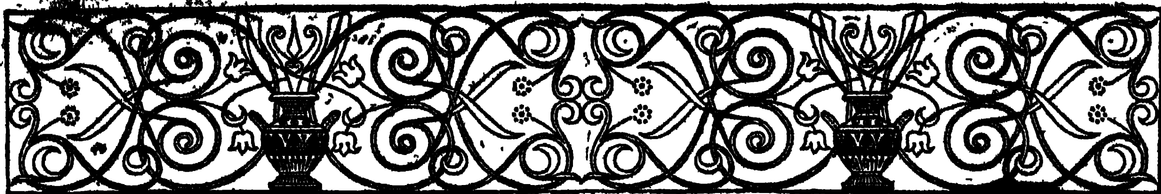
Lower Bavaria

Explanation of Characters

Towns above 100,000 inhabitants	BERLIN
from 50 – 100,000	STETTIN
20 – 50,000	Bonn
10 – 20,000	Heidelberg
under 10,000	Bingen

The Governments (Regierungsbezirke) of Prussia & the Circles of Bavaria, Saxony & Baden are named after their principal Towns which are underlined Oppeln

Railways in Operation



THE



ILLUSTRATED

GLOBE ENCYCLOPÆDIA.

Shenando'ah, a river of the United States, rises in Augusta county, Virginia, and flows N.W. through a beautiful and fertile valley, known as the 'Valley of Virginia,' until it joins the Potomac at Harper's Ferry. Its 'North Fork' joins at Front Royal. Its length is about 170 miles, for 40 miles of which it is navigable for barges. The valley was the scene of severe fighting during the Civil War. One of the most famous of the Confederate cruisers was named after the S.

Shen'dy, a town of Nubia, on the right bank of the Nile, 120 miles below Khartum (q. v.). It has a considerable trade in wheat, millet, senna, salt, cottons, and cattle. Pop. 10,000.

Shen-se, a province in the N. of China W. of Shan-se. Area, 81,216 sq. miles; pop. (1852) 14,098,499. It is hilly but fertile, and very rich in coal and other minerals. It suffered greatly during the famine of 1875-78.

Shen'stone, William, son of Thomas Shenstone, a gentleman farmer who owned the estate of Leasowes (worth about £300 a year), was born at Hales-Owen, Shropshire, November 18, 1714, educated as a commoner at Pembroke College, Oxford, and in his student days published *Poems upon Various Occasions* (1737), which he afterwards endeavoured to suppress. In 1741 appeared his *Judgment of Hercules*, and the next year saw his most considerable poem, *The Schoolmistress*, its homely theme treated in the stately Spenserian stanza. S. burdened his small estate with debt in seeking to beautify it, and before his death had made it so picturesque that his heirs had to sell it. He died February 11, 1763. His Works were published by Dodsley (3 vols. 1764-69), and there are new editions of his pithy *Essays on Men, Manners, and Things* (Lond. 1868), and *Poems*, with a Memoir by the late George Gilfillan (Edin. 1854).

She'ol (Heb. 'cavity,' from *shaal*, 'to dig') was the Hebrew under-world, which is described in the Old Testament as a vast subterranean place (Job xi. 8), full of thick darkness (*ib.* x. 21, 22), where dwell the shades of the dead (Ps. xxx. 3 [pit], lxxxix. 48 [grave]) and poetically as having valleys (Prov. ix. 18 [depths]), and gates and bars (Job xvii. 16; Isa. xxxviii. 10). See HELL.

Shep'herd's Dog. See COLLEY or COLLIE.

Shep'herd's Purse, a name given to *Capsella bursa pastoris*, the commonest British representative of the order *Cruciferæ*, occurring in all situations up to 1200 feet. It is an annual weed, with radical leaves spread in a rosette, from which arise branched stems with clasping leaves and small white flowers. The plant is indigenous in temperate and Arctic Europe, N. Africa, and Asia to the Himalaya; and has now been introduced into all temperate climates.

Shepp'ey, Isle of (Old Eng. *Sceápig*, 'Sheep Isle'), in the N. of the county of Kent, is separated from the mainland by the Swale, and bounded W. by the Medway, and N. and E. by the North Sea. Area, 19,682 acres; pop. (1871) 18,434. It is 9 miles long by 4½ broad, and consists of seven parishes, two of which, Harty and Elmley, are islands in themselves, formed by the salt-water ditches or 'fleets,' which run up into the interior, from the mud-banks of the S. shore. The soil is rich, and the surface generally low and marshy. On the N. side, however, there are cliffs from 60 to 80 feet high, which suffer an excessive denudation from the sea, as much as 50 acres of land having been washed away in twenty years, according to Sir C. Lyell. The whole island is composed of London clay, which is supposed to have formed the delta of an ancient river, and in which are found rich deposits of fossil tropical vegetation, of the Eocene age, chiefly at Warden Point and Hensbrook. Many barrows, called 'cotterels,' some of them 10 feet high, exist, and are supposed to have been burial-places of the Norsemen. The principal occupations of the people are fishing and farming; the isle is still famous for its mutton. Rich oyster-beds extend along the coast, from Milton to Sheerness (q. v.), the only town in S. See Huxley's *Physiography* (Lond. 1877), and Bevan's *Handbook to the County of Kent* (Lond. 1878).

Shep'ton-Mall'et, a town of Somerset, England, 4½ miles E.S.E. of Wells by rail. It is a place of great antiquity, being mentioned in Doomsday Book There is a fine old parish church. Silk, crape, and stockings are the chief manufactures, and there are several breweries. Pop. (1871) 4363.

Sher'bet (Ar. *sharbat*, 'a drink'), a cooling beverage of Eastern origin composed of fruit-juices mixed with water, and sweetened and flavoured.

Sher'borne (the 'clear burn' or stream), a market-town of Dorsetshire, England, 18 miles N.N.W. of Dorchester by rail, stands in the pleasant Vale of Blackmore, on the southern slope of a hill above the Yeo. The cruciform abbey church of St. Mary, a noble Perpendicular structure (207 by 102 feet), with a Norman tower (114 feet), porch, and transepts, was splendidly restored by the Digby family (1849-56). Other buildings are the Literary Institute (1850), the Yeatman Memorial Hospital (1865-69), Bishop Neville's 15th-c. Hospital of St. John, S. Castle, an Elizabethan mansion built by Raleigh (1593) in the grounds of the old Norman castle (1110-39) of Roger of Salisbury, now in ruins, and Forster's Middle-Class School (1875). Here also is the King's School (1550), originally located in narrow compass on the site of, and in close proximity to, the Abbey Lady Chapel. This has been gradually extended; in 1851 the ancient Abbot's Hall, the Guesten Hall, the Abbot's

Lodgings, &c., were converted into school buildings, and soon after a new headmaster's house and spacious dormitories were built. In 1877 a large quadrangle was formed by the addition of a spacious schoolroom in the style of the 15th c., the Abbot's Hall, now serving as the chapel, being at the same time enlarged. S. ranks high among Public Schools (q. v.), and in October 1878 had 18 masters and 295 boys. Glove-making employed 260 women in 1871, and there are large silk factories. Pop. (1871) 6129. In 705, Ini, King of Wessex, raised S. to a bishopric, with St. Ealdhelm for its first bishop, whose twenty-fifth successor, Herman, transferred the see to Old Sarum (1072). See Hutchins' *History of Dorsetshire* (3d ed. 1861-74).

Shere Ali, Amir of Afghanistan, was born about 1823. On the death of his father, Dost Mahommed, in 1863, he succeeded to the throne, though only the third surviving son, in accordance with the rule of paternal nomination. His early reign was one continual quarrel with those of his own blood. Though at first he maintained his authority, he was driven out of his capital, Cabul, in 1866, and gradually forced back to Candahar and Herat, which latter stronghold was always held for him by his eldest son, Yakub Khan. But the Indian Government of Lord Lawrence refused to recognise his rival brother; and by the spring of 1868 he had again established himself throughout Afghanistan. In March 1869 took place the celebrated Umballa Durbar, at which Lord Mayo, with exceptional magnificence, entertained S. A., 500 miles within the British frontier. The Amir received £120,000 in cash, 10,000 stand of muskets, and a battery of light guns; and cordial expressions of mutual friendship were interchanged. He has since attempted, without much success, to introduce European reforms into Afghanistan, and his supremacy has been outwardly undisturbed. But his avowed preference for a younger son, Abdulah Jan, who died in August 1878, caused Yakub Khan to threaten rebellion. He was first appeased with the government of Herat; but in 1875, with genuine Afghan treachery, he was enticed to Cabul, and thrown into prison. The name of S. A. has recently attracted great interest in England. The armed occupation of Quettah (q. v.) and other measures aroused his suspicious nature. In 1877 his envoy at Peshawur rejected the proposals brought by Sir L. Pelly, which are supposed to have involved the reception of a British Resident at Cabul. All direct relations between Afghanistan and the Indian Government have since been suspended. In August 1878 a Russian mission under General Abramof, with a strong escort, was honourably entertained at Cabul; and in the following month a similar British mission under Sir Neville Chamberlain was contumeliously turned back at the mouth of the Khyber Pass (q. v.). The result was a war between Britain and Afghanistan, in which the latter was rapidly and completely beaten. S. A. was forced to flee from Cabul, and took refuge near the Russian frontier, where he died at Mazan-i-Sherif, 21st February 1879. See *Essays on the External Policy of India*, by J. W. S. Wyllie (Lond. 1875).

Sher'idan, Richard Brinsley Butler, was born in Dublin, 30th September 1751. His grandfather was Dr. Thomas S. (1684–1738), a 'punning, quibbling, fiddling parson;' his father, Thomas S., M.A. (1721–88), by turn an actor, manager, rhetorician, and lexicographer; his mother, Frances S., *née* Chamberlayne (1724–66), the 'quite celestial' author of two novels and comedies. Richard himself, after a year's schooling at Dublin, was sent to Harrow (1762), left it a dunce, but in 1771 published a verse translation of Aristænetus' Epistles. His elopement and double marriage with Miss Linley the singer were followed by his admission to the Middle Temple; but briefs came slowly in, £3000 presented to the lady by an ancient flame ran dry, and the would-be barrister betook himself to play-writing. The comedy of *The Rivals* (1775), damned through bad acting on its first production, when repeated, proved a brilliant hit, yet was well-nigh eclipsed by the comic opera of *The Duenna*. Before the year was out their author was a joint proprietor of Drury Lane—whence deriving the purchase-money, £10,000, is still a mystery—and here in 1777 he brought out *The School for Scandal*, the most finished and faultless comedy in the language, as *The Critic* (1779) is the wittiest farce. At the Literary Club, where Johnson proposed him (1777), he struck up an intimacy with Charles James Fox, and through his influence was returned to Parliament for Stafford (1780). Though his maiden speech was little better received than *The Rivals*, S. obtained office in the Rockingham and Coalition Ministries, and in supporting Hastings' impeachment (1787) 'surpassed,' said Pitt, 'all the eloquence of ancient and modern times.' The purchase, however, of an estate in Surrey on the occasion of a second marriage (1795), crippled his never-abundant means; dissipation, theatrical losses, and the loss by fire of Drury Lane itself (1809), still further reduced them; and beset by duns, worn out in mind and body, S. died in London, 7th July 1816. Save Rogers, Moore, and Holland, all had forsaken him—even 'Europe's First Gentleman,' to whom he was long an unpaid jester; but royal dukes remembered him when dead, and stood by his grave in Poets' Corner. Besides the already-mentioned plays, S. drew upon Molière for *St. Patrick's Day* (1775), upon Vanbrugh for *The Trip to Scarborough* (1777), and upon Kotzebue for his poor 'aftermath,' *The Stranger* (1798) and *Pizarro* (1799). Indeed, even his two inimitable plays, whose 'Joseph Surface' and 'Mrs. Malaprop' live upon every stage, were adaptations from Murphy, Colman, and others of S.'s forerunners. That is, he took rough gems, and by his polishing and splendid setting gave them a value they had never else possessed. Memoirs of S. are prefixed to the editions of his Dramatic Works by Leigh Hunt (1840), and Browne (2 vols. 1873), and to Stainforth's edition of his complete Works (1874); his *Life* was written by Watkins (2 vols. 1817) and Moore (2 vols. 1825). See also Lecture viii. of Hazlitt's *Lectures on the Comic English Writers* (3d ed. 1841), and *S. and His Times* (2 vols. 1859).

Sher'idan, Philip Henry, a distinguished American general, was born at Somerset, Ohio, 6th March 1831. He was educated at West Point, and from 1853 to 1861 he served in Texas and on the Pacific coast. On the outbreak of the Civil War, S. was a captain in the 13th Infantry. At first he held subordinate commands in the west, but in the autumn of 1862 he was transferred to the Army of Ohio, and commanded a division at the battle of Perryville, and again at the battle of Murfreesboro, where he distinguished himself so greatly as to be gazetted major-general of volunteers. In 1863 he served with distinction under Grant at the battle of Chattanooga, and on Grant's transference to the E. he took S. with him, appointing him chief of cavalry of the Army of the Potomac. In the protracted struggle between Grant and Lee in 1864 and 1865 S. rendered the most brilliant services to his chief in several daring cavalry raids into the enemy's country, but especially in the battles of the Wilderness, of Opequan Creek and Cedar Creek, and the final struggles around Five Forks and Appomattox which resulted in the surrender of Lee. In the autumn of 1864 the thanks of Congress were bestowed upon S. and his troops, and he was created major-general in the regular army. Since the war he has held various military commands, and has been raised to the rank of lieutenant-general. He visited Europe, and was a spectator of part of the struggle between the Germans and French. In 1875 he was instrumental in quelling the disturbances in Louisiana.

Sherif' (Arab. 'noble'), the title of a descendant of Mohammed through his daughters Fatima and Ali, now widespread in the Moslem aristocracy. It is common to either sex, the women who inherit wearing a green veil, the men a green turban. In Africa many of the Moslem dynasties were founded by sherifs.

Sher'iff, in Scotch law, denotes two classes of legal officials —the S.-*Depute* and the S.-*Substitute*. From the decision of the latter an appeal lies to the S.-depute, except in criminal matters and in small-debt actions. The civil jurisdiction of the Scotch S. embraces all personal actions on contract, bond, or obligation, actions for rent, forthcomings, poindings of the ground, and possessory actions. He has a summary jurisdiction in all cases whose subject does not exceed the value of £12. The judgments of a S.-depute in civil causes are subject to the review of the Court of Session alone. When the case is partly civil and partly criminal, the Court of Justiciary is the proper court of review. The criminal jurisdiction of the S. embraces all crimes or offences whose penalty is not greater than two years' imprisonment. He has unlimited jurisdiction in matters of bankruptcy and insolvency. He revises lists of parliamentary electors, and he executes and returns to the Crown Office writs for electing members of Parliament. He also discharges the functions of Commissary (q. v.). For S. in England see SHIRE.

Sheriff-Clerk' is, in Scotland, the clerk to the Sheriff-Court.

Sheriff-Court'. See SHERIFF.

Sheriffmuir', a barren spot in the county of Perthshire, Scotland, 5 miles N.E. of Stirling, celebrated as the scene of a conflict between 9000 Jacobites under the Earl of Mar and 3500 royalists under the Duke of Argyle, November 13, 1715. The result was indecisive, the right wing of each army being victorious over the other's left, and the fugitives fleeing in opposite directions. This double discomfiture is humorously sketched in a popular ballad of the period. Burns also penned some rough and racy stanzas on the event.

Sher'lock, William, an English divine, was born at London in 1641, studied at Eton and Cambridge, and became rector of St. George's, London, in 1669. From 1681 to 1689 he was Canon of St. Paul's; in the latter year he was suspended for refusing to preach to King William, but yielding, was reinstated in 1691. He died at Hampstead, 19th June 1707. His *Practical Discourse Concerning Death* (1690), which has passed through more than forty editions, his *Vindication of the Doctrine of the Trinity* (1691), and his *Treatise on the Immortality of the Soul* (1704), are the best known of his voluminous writings.—**Thomas S.**, son of the preceding, born in London in 1678, educated at Eton and Cambridge, where he obtained a fellowship in 1701, succeeded his father in the Mastership of the Temple in 1704, and was elected Vice-Chancellor of his university ten years later. In 1715, concealing his Tory sympathies, he was appointed Dean of Chichester; but in 1717 he stoutly defended against Hoadley the maintenance of the Test Acts, and was removed from the list of royal chaplains. Yet in 1727 he succeeded Hoadley in the bishopric of Bangor, and again in that of Salisbury (1734). During these years he ably combated the doctrines of Collins, Woolston, and other leading rationalists of the day. Declining the Primacy in 1747 he next year accepted the see of London, and died at Fulham, 18th July 1761. A work on *The Use of Prophecy* (1725), *A Vindication of the Christian Religion* (1728), the able and popular *Trial of the Witnesses of Jesus Christ* (1729), and five volumes of *Sermons*, are his chief literary remains.

Sher'man, William Tecumseh, one of the greatest American generals, was born at Lancaster, Ohio, 18th February 1820. Educated at West Point, he entered the army as a lieutenant of artillery in 1840. After serving in Florida and California, he withdrew from the service in 1853, and began business as a banker in San Francisco. At the outbreak of the Civil War he was superintendent of the Louisiana Military Academy, but resigned his post when the State seceded, and offered his services to the Federal Government. He served at the battle of Bull Run as a colonel of infantry, and was shortly after promoted to the rank of brigadier-general of volunteers, receiving command of the department of Ohio. Having stated publicly that for offensive operations he ought to have 200,000 men, it was rumoured that he was insane, and he was removed from his post, but fully regained his military reputation at the battle of Shiloh (q. v.). S. took a prominent part in the operations under Grant around Vicksburg and Memphis in 1862 and 1863. On February 2, 1864, he started from Vicksburg on his famous march to Meridian, the railroad centre of the S.-W., which has been described as a rehearsal for his yet more famous march from Atlanta, but which, owing to a mistake on the part of General Smith, who was to have co-operated with him, was a partial failure. The battles with Hood in Tennessee intervened between this and his great final achievement, the advance from Atlanta 'down to the sea,' which began on the 12th of November. He marched through Georgia, devastating everything on his passage, took Savannah on the 20th of December, and then turned northwards through S. Carolina, and, pursuing the same tactics, compelled the surrender of Johnston's army at Durham Station, 26th April 1865. Washington was reached on the 24th of May, and there, after a grand review, the army which had thus performed one of the most notable of modern military achievements was dissolved. S. ranks along with Grant on the Federal side, and Stonewall Jackson and Lee on the Confederate side, among the very foremost of the great soldiers produced by the Civil War. In originality of design, and fertility of resource, he is perhaps the prince of Transatlantic generals. S. is now (1878) commander-in-chief of the United States army. His *Memoirs of General W. T. S. by Himself* (New York and London, 1875) are allowed to be extremely truthful and graphic, but are rather marred by an ungenerous criticism of his colleagues.

Sherr'y (from Xeres), a generic name for white wines produced in the district of Cadiz in Spain. The principal vineyards are situated near Xeres de la Frontera, the soil there, composed of carbonates of lime and magnesia mixed with clay, yielding the finest quality of S. A full S. vintage averages about 50,000 butts. The annual shipments from Cadiz and Puerto de St. Maria, however, greatly exceed this amount, and the difference is accounted for by the fact that wines are forwarded from other parts of Spain to be made up for export as genuine sherries. In 1874, the export of S. from Xeres and Puerto de St. Maria amounted to 65,363 butts; in 1876, from Xeres alone, 42,622 butts, of which 37,734 were destined for British ports and colonies. Pure S. is a pale, thin, dry wine, and among the finest kinds are Vino Fino, Amontillado, and Manzanilla. These, however, are for the most part retained at Cadiz to form 'Solera,' or 'old-mother-wine,' which is added to inferior wines to induce etherification and improve their quality. The varieties of S. imported into Great Britain vary very much in colour, body, and taste. All export S. is fortified with brandy or alcohol. A factitious wine called 'Hambro' S.' is extensively imported into Great Britain from Germany.

Sher'wood Forest (the forest where the 'shire' motes or meetings were held), a hilly district in the W. of Nottinghamshire, 25 miles by 8, noted in popular legend, and immortalised in *Ivanhoe* as the haunt of Robin Hood (q. v.). Though disafforested, it still contains many fine trees. See White's *Worksop, the Dukery, and Sherwood Forest* (Lond. 1875).

Shet'land, or **Zet'land Islands** (Old Norse, *Hialtlandia*, 'the viking's land'), a group of above ninety islands (of which thirty are inhabited) lying N.N.E. of the Orkney Islands (q. v.), together with which they form a county, returning one member to Parliament. Area, 325 sq. miles; pop. (1871) 31,608, being 97 persons to the sq. mile. The principal are the Mainland (60 miles long, but narrow); N.E. of it Yell (20 miles by 6), Unst (11 miles by 6); Fetlar, Walsay, and Bressay. The lonely islands of Foula, 20 miles W. of Mainland, and Fair Island 25 miles S. of it, are also included in the S. group. The rocks are chiefly Silurian, highly metamorphosed, resting on Laurentian gneiss, and covered in the S. by fragments of the Old Red Sandstone, which characterises the Orkneys. The coast-line of the islands is rocky and precipitous, and much indented; their surface is rocky and bare. The highest summit is Rona Hill, 1590 feet high, in the N. of Mainland: Foula Island attains a height of 1400 feet. The scenery of the islands is very grand. S. is divided into twelve parishes, and contains seventeen Established churches, nine Free churches, six Congregational, five Baptist churches, and an Episcopal church. Of the 208,579 acres in S., 51,803 were under cultivation in 1876. There were 2388 acres of bere (a coarse barley), 8471 of oats, 2749 of potatoes, 618 of turnips, 200 of cabbage, &c., 648 in clover under rotation, 35,027 in permanent pasture. The climate is humid and mild, but severe storms rage during winter. It seems peculiarly healthy for the natives, who frequently attain a great age, and enjoy unusual freedom from pulmonary diseases. In the latitude of S. in midsummer daylight continues throughout the whole 24 hours, while in midwinter the sun is only above the horizon for $5\frac{1}{4}$ hours.

The chief occupation of the Shetlanders is fishing. Cod, ling, tusk, saithe or coal-fish, and herring are caught in great numbers. The bottle-nosed whale and seal are also hunted. The fishing-boats number (1878) 1137, and the men and boys employed 4790. Most of the fishermen possess also small crofts of land, on which they raise oats, bere, turnips, and potatoes. They have an excellent character as sailors throughout the mercantile marine, and many are employed in the Arctic whale-fishery. S. produces peculiar diminutive breeds of horses, cattle, and sheep. In 1876 the islands contained 5772 horses and ponies, 21,050 cattle, 87,925 sheep, and 4663 pigs. The ponies, called *shelties*, are remarkably sure-footed. They were formerly regarded as common property, and ran wild on the moors. Many are exported for use in coal-mines. The salted beef of S. is very delicate, and the sheep afford an excellent wool. The women spend much of their time in knitting, and S. hosiery has long been famous. Though a variety of minerals are found in small quantities, chromate of

iron is the only one obtainable in quantities worth exporting. The chief town of S. is Lerwick (q. v.), 100 miles N. of Kirkwall, with which it communicates by weekly steamers. The only other towns are Hillswick and Scalloway. The chief antiquities are the ruins of Scalloway Castle and of numerous so-called 'Pictish' towers, the chief being Mousa, 12 miles from Lerwick. The S. islands were early peopled by Northmen, and along with the Orkneys were attached to the kingdom of Denmark. Robert Sinclair, Earl of Orkney, held them under the kings of Denmark. In 1469 they were attached to Scotland as dowry of Margaret of Denmark, James III.'s bride. After passing through the hands of various noblemen they were sold in 1766 to Sir Lawrence Dundas, in whose family (the Earls of Zetland) they still remain. Old Norse customs long survived, and are not yet quite extinct, but the English language is now universal. A rich though little-wrought vein of folk-lore is indicated by the survival of many curious incantations or spell-songs, which bear the impress of Odinic origin. A transfigured relic of an Eddic lay—a fragment of Odin's Rune song in a Christianised version —from the lips of an inhabitant of Unst, was received by Karl Blind in 1877.

Shibb'oleth (Heb. 'stream') was the word which the Gileadites under Jephthah made use of at the fords of the Jordan to test the defeated Ephraimites, whom they detected by their inability to pronounce *sh* otherwise than as *s* (Judges xii. 1-6). Hence, in modern English, S. means any peculiarity of opinion which is a test of the adherents of a party or sect.

Shi'ahs. See MOHAMMEDAN SECTS.

Shiel, a loch in the S.W. of Inverness-shire, Scotland, 15 miles long by 2 broad, separating the district of Moidart on the N. from Sunart and Ardgower on the S., and communicating with the sea by Shiel Water and Loch Moidart.

Shield (Ger. *schild*), a piece of defensive armour, consisting of a broad plate carried on the left arm to ward off the missiles or blows of an enemy. It is of great antiquity, but after the introduction of firearms it gradually became obsolete among civilised nations, and is now only used among savage races. The S. of the Homeric age was formed of metal or of bull's hide, wicker, or wood, bound or covered with metal, and was large enough to cover a man. The later Greek shields were more portable, circular or oval, and convex. The S. of Achilles was a marvel of art workmanship (*Iliad*, xviii. 542). The Roman *clipeus* was also round and convex with a boss; the *scutum* was oblong, and curved so as to fit round the body. The Gallic S. was usually oval, and made of osiers or wood, leather-covered and metal-mounted; and of a like nature, having central bosses, were the shields of the Old English, Danes, &c. During the 10th and 11th centuries the 'kite-shaped' or Norman S. prevailed; it was originally flat, afterwards semi-cylindrical. On it were emblazoned distinctive figures and emblems, the immediate origin of the personal armorial bearings commonly borne on the S. in the 12th c. (see HERALDRY). The practice of painting devices on the S. may be traced even in Greek times, and was common among the Germanic tribes, as Tacitus testifies. The old German word *schildern*, 'to paint,' from *schild*, recalls the custom. The 'kite-shaped' S. was succeeded by a smaller one of triangular form, and in the 14th c. the sides of it were rounded, forming the 'heater-shape' of antiquaries. The knightly S. was supported by means of the *guige*, a belt passed across the right shoulder. With the changed conditions of warfare in the 16th c., the S. with heraldic insignia assumed fantastic forms, and then ceased to be carried to battle. Bucklers, roundels, and rondaches were still used in the 17th c., and even in the 18th the Scottish Highlanders fought with the target and broadsword.

Shields, North, a town of Northumberland, England, at the mouth of the Tyne, 7½ miles E. of Newcastle. It stands on the N. bank of the Tyne opposite South Shields (q. v.). There are 5 Episcopal churches and 16 dissenting chapels. Other public buildings are the Townhall, Tyne Sailors' Home, Custom-House, Mercantile Marine Offices, and the Albion and Royal Assembly Rooms. Tynemouth Aquarium and Winter-gardens (309 feet by 117 feet), erected at a cost of £100,000, were opened 28th August 1878. The style is Italian Renaissance, and the façade measures 336 feet in length. The town contains several large iron-foundries, besides which shipbuilding and the subservient manufactures of cables, anchors, sailcloth, &c. are the main industries. Eight boats of 178 tons were built here in 1877. There are a few breweries, salt-pans, and brick-kilns. N. S. returns one member to Parliament, and has one daily newspaper. Many collieries are worked in the vicinity, and much coal and iron are exported from the town, which thus serves as a port of Newcastle, since large vessels cannot ascend the river to the latter place. The harbour and quays can accommodate 2000 large ships. In 1877 the imports amounted to £172,245; the exports to £281,011; and the customs to £25,887. There entered 736 vessels of 246,693 tons, and cleared 929 of 293,981 tons, exclusive of coasting vessels; and on December 31 of the same year, 469 vessels of 142,191 tons were registered as belonging to S., besides 437 fishing-boats. Pop. of borough (1871) 38,941. A village existed here in the time of Edward I., and Cromwell passed an Act for the erection of quays, &c., but the real growth of the modern town dates from the close of last century, when restrictions on its trade were removed. In 1849 the borough of Tynemouth was constituted, comprising the three wards of Percy, Tynemouth, and N. S., but the whole town is usually called N. S.

Shields, South, a town of Durham, England, at the mouth of the Tyne, opposite North Shields, 17 miles N.E. of Durham by rail. It stretches for 2 miles along the river bank, and is in many parts dirty and overcrowded. There are 8 Episcopal churches, including the parish church of St. Hilda, and 10 dissenting chapels. The town-hall, the theatre, and Public Free Library, Custom-House, and Mercantile Marine Offices are the chief public buildings. A new workhouse, to hold 700 inmates and covering 4 acres, is now (1878) being built at a cost of £42,000. Shipbuilding is the chief industry, 25 vessels of 5910 tons having been built here in 1877. There are also rope-walks, sail-factories, iron-foundries, potteries, chemical works, &c. Vast quantities of coal are exported. The extensive harbour contains thirteen dry docks. In 1877 the imports amounted to £1,077,498; the exports to £166,036; and the customs to £9217. There entered 586 vessels, of 278,321 tons, and cleared 364, of 191,079 tons, exclusive of coasting vessels; and on December 31 of the same year, 187 vessels of 69,042 tons were registered as belonging to S. Pop. (1871) 45,336. A fort occupied the site of this town during the time of the Romans, and in the middle ages it was long a fishing station. From the sheds which lined the shore it was called *Le Sheeles*, whence the modern name is derived. Salt-pans long flourished here, and extensive glassworks were started last century. The borough was enfranchised in 1832, and returns one member to Parliament. It has one daily newspaper. It was here in 1790 that Greathead and Wouldhave, natives of the place, launched the first lifeboat.

Shikárpúr, the chief town of the district of the same name, Scinde, British India, 18 miles W. of the Indus, and 330 miles N. of Kurachi. It was founded about 1617, is walled, but has no important buildings. The surrounding country is irrigated with canals. S. stands at the foot of the Bolan Pass, the chief commercial route to Kelat and Afghanistan. Its imports are estimated at £300,000, of which piece-goods and grain are the most valuable; the exports at £100,000, including wool and spices. S. merchants and bankers are renowned throughout the East. The manufactures are carpets, cotton cloth, and paper, which are carried on profitably in the jail. Pop. (1872) 38,107. —S. *district* lies between Kelat and Rajputana on both banks of the Indus. Area 8813 sq. miles; pop. (1872) 776,227. The chief crops are millets, cotton, wheat, barley, rice, and indigo. See Captain Burton's *Scinde Revisited* (Lond. 1877).

Shil'ka, a river of Eastern Siberia, rises in the Trans-Baikal region, among the Yablonoi Mountains, and after a N.E. course of 260 miles falls into the Amur (q. v.) a little beyond Ust Strelka. It is navigable for boats to the foot of the Yablonoi Mountains, and is historically interesting as the 'point of departure' for the Russians in their conquests on the Lower Amur.

Shill'ing, a British coin of currency and account, equal in value to 12 pennies and 1-20th of a pound sterling. Before the reign of Edward I. it fluctuated greatly in value, from five-pence to twenty-pence, with various intermediate values. The coin is in use in several of the states of N. Germany and Denmark, the best known being the Hamburg *schilling*, which is valued at one penny English money.

Shillong' (*Silang*), the administrative capital since 1874 of the province of Assam, British India, and the headquarters of the district of the Cossya and Jynteah Hills (q. v.). It lies among the mountains that form the watershed between the Brahmaputra and Surma river systems, 4900 feet above the sea. It is connected on the N. with Gowhatty (q. v.), the former capital of the province, by a good cart-road. S. is healthy and conveniently situated, and has much increased since it became the residence of the chief commissioner and his staff. There is a church, and permanent official buildings are (1878) being erected. Pop. (1872) 1393.

Shi'loh, Battle of, fought on the Tennessee River, Tennessee, on the 6th and 7th of April 1862, between the Federal army under Generals Grant and Sherman, and the Confederates under Generals Johnston and Beauregard. On the first day of the battle the advantage lay with the Confederates; on the second, the Union army, having received reinforcements, defeated their opponents, and forced them to retreat to Corinth.

Shimo'ga, the chief town of the district of the same name, in the State of Mysore, India, on the left bank of the Tunga river, a tributary of the Kistna, 171 miles N.W. of Bangalore; pop. (1871) 11,034. Paper and chintz are manufactured.—The *district* of S., which lies in the extreme N W. of Mysore, has an area of 3797 sq. miles; pop. (1871) 498,976. The crops are rice, *ragee*, sugar-cane, areca nuts, and coffee. At the village of Sorab the best sandal-wood carving in India is executed. By the falls of Gersoppa, which are among the finest in the world, the Sharavati river, 250 yards wide, throws itself down the E. Ghauts with a leap of 960 feet At Sulekere is an artificial lake 40 miles in circumference, which is now being utilised for irrigation.

Shin, a loch in Sutherlandshire, Scotland, 15 miles long by 2 broad, discharges by the river S. into Dornoch Firth. It abounds with trout and salmon.

Shing-King, a province of Mantchuria (q. v.), bounded S. by the Gulf of Leao Tong and Corea Bay, W. by the Palisade, or Barrier of Stakes, a continuation of the Great Wall, E. by Corea, and N. by Kir-in-ula. Area, 40,000 sq. miles; pop. about 2,166,000, of whom 942,003 are Chinese. The capital is Mukden (q. v.). The surface is mountainous, but the valleys are fruitful, and the soil is known to contain much coal, iron, gold, &c. Agricultural produce is exported. In 1875 the value of the exports was £511,448, and of the imports £709,660.

Shingles (Comp. Ger. *schindel*; Lat. *scindula*, from *scindo*, 'I split'), are thin narrow boards of oak or pine somewhat resembling the staves of a tub, and are used instead of slates or tiles for covering a roof. They are cut by machinery.

Shingles (Lat. *cingulum*, 'a girdle') is the popular name for the variety of Herpes (q. v.) known as *Herpes Zoster*. It is characterised by the arrangement of the inflamed patches, with their clustered vesicles, in the form of a half zone, following the distribution of one of the intercostal nerves, and extending from the back to the sternum. S. is generally preceded by slight fever and severe pain in the parts; the eruption runs its course in about a fortnight.

Ship (Old Eng. *scip*, Norse *skip*, Old Ger. *skif*, mod. Ger. *schiff*. the root-meaning is perhaps seen in the Gr. *skaphē*, 'a boat,' from *skaptō*, 'I scoop'), a general term for large vessels of whatever kind, formerly applied only to such as had three complete masts.

Ship'broker, an agent in a seaport town whose business it is to procure and collect *freights*, to enter and clear vessels at the custom-house, and generally to arrange matters of business between shipowners and merchants. Most shipbrokers act also as *Insurance Brokers*, in which capacity they negotiate marine insurances between owners and underwriters, and settle all details, such as the amount and conditions of the risk, the rates of premium required, and the proportionate sums recoverable in the event of partial loss. An insurance broker is responsible for the amount of premium to the underwriter, but not for the settlement of a claim to the owner who makes it. The remuneration of ship and insurance brokers is by commission, in the former case about 2 per cent. on receipts, and the latter 5 per cent. on premiums, and ½ per cent. on claims paid.

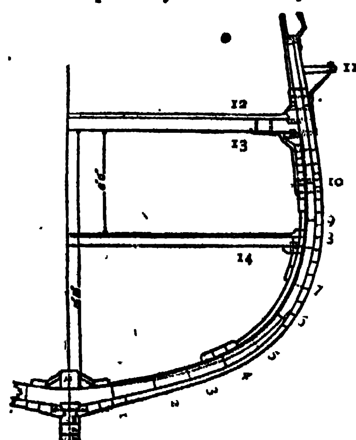
Ship'-building. Naval architecture is an art of unparalleled importance in the commerce of the world; and in maritime nations, of which Great Britain is still the first, it is simply the mainstay of national prosperity. No country has more assiduously cultivated the art than Great Britain, and its operations bulk prominently among all British industries. Formerly S. operations were prosecuted as a result of precedent and experience as regards outline, strength, &c., of vessels; now all data for construction are calculated from mathematical principles, and naval architecture thus ranks among scientific industries.

To trace the slow development of S. from the primitive raft or canoe hollowed out of a single trunk—the vessel of our prehistoric ancestors—down to the ironclad war-ships and magnificent merchant steamers of the present day, would be a task as instructive as interesting. But the subject is too vast and varied to permit here more than the briefest notice of the salient points in the history and present state of the art. Doubtless, canoes hollowed out of the trunks of trees, such as are occasionally found in excavating old river-courses, beaches, &c., and which yet continue in use among rude Pacific tribes, were the kind of vessels first made. The paintings and carvings of the early Egyptians show that the art of building boats of planks, and propelling them by sails was known to that people. Basket or wicker-work structures covered with skins or hides were also in use at a very early period, and under the name of Coracles (q. v.) have persisted till modern times. The Phœnicians were the first nation of antiquity who derived greatness from maritime enterprise, and that their ships must have been of considerable size is indicated by the fact that they circumnavigated Africa, starting from the Red Sea and entering the Mediterranean by the Straits of Gibraltar—a voyage of three years' duration. Roman shipping, during the palmy days of the empire, was distinguished into three classes—*naves longæ*, ships of war; *naves onerariæ*, merchant vessels; and *naves liburnæ*, which were equivalent to passenger or despatch boats. The war vessels varied in size from boats with a single bank of oars up to galleys with five banks or rows of oars, called *quinqueremes*. The *triremis*, or three-bank galley, the ordinary type of a war vessel, was constructed with decks or platforms at both extremities, and open in the middle; and those of greater size were completely covered with a deck. The use of sails in the larger class of vessels became general in the early part of the 14th c., and coincidently the discovery or introduction of the mariner's compass gave an enormous impetus to navigation, enabling sailors to dash boldly from coast to coast across seas, instead of timidly hugging dangerous coasts. In the hands of the Venetians, Genoese, Portuguese, Spaniards, Dutch, and English respectively, the art of S. was maintained and has gradually advanced to its present pitch of excellence. The changes and improvements in naval architecture have been greater, more numerous, and important in the 19th c. than the combined advances of all previous ages.

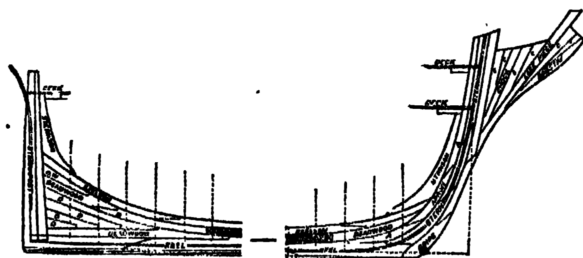
So far as regards the building and fitting up of the hulls and rigging of vessels, which is the work of the shipbuilder proper, modern S. is of two different kinds, one having to do with the building of wooden ships, and the other with the building of iron and steel ships. The construction of armour-plated ships of war may be considered a third kind standing apart, as their purposes and needs are totally different from those of merchant vessels.

Wooden S.—In proceeding to design any vessel, the builder is guided as to general principles not only by accumulated experience, but by the result of an extensive and complex series of mathematical calculations, by which the essential elements of the body of any ship are determined, and questions connected with the stability of floating bodies and other theoretical questions are settled. He at the same time must know the nature of the service for which the vessel is intended, and by calculation he arranges that the displacement or total weight of the vessel afloat shall be in accordance with the required draught of water. The relations of displacement and draught of water are dependent on the length, breadth, and depth of vessel, and the settlement of these proportions is affected by questions as to steering power, stability, and sailing qualities. Further, the weight of the completed vessel, and the freight for which it is intended, must, as far as practicable, be determined beforehand. With these data the designer prepares the constructive drawings of the proposed vessel, three plans being required,—the body plan, the sheer plan, and the

half-breadth plan. The body plan consists of two equal divisions giving the outline of the proposed vessel as seen from before and behind, at its widest part, and these divisions are called respectively the fore-body and after-body. The sheer plan is a side plan of the ship, and the half-breadth plan is, as the name indicates, an outline in one half of the vessel as seen from above. These plans, with certain sectional lines laid down on them, are essential to enable the builder to make various calculations upon which the stability and other qualities of the ship to be built depend. In the practical work of building, the first operation is to 'lay off' on the 'mould-loft' floor, from the prepared plans and drawings, lines representing the full size and real dimensions of the principal parts of the vessel. From these moulds or skeleton outlines are taken for the guidance of the workmen in constructing the various parts of the work. The *keel* is the first part laid down, and it consists of long pieces of elm held together by horizontal scarfs, so as to form in effect one continuous beam. It is the most important part of the vessel, as it forms the connecting link of all parts of the structure. The keel is connected to the stern by a 'scarf,' and to the stern-post



CROSS SECTION OF WOODEN SHIP.



SECTION OF WOODEN SHIP LENGTHWAYS.

it is united by mortice and tenon. The *keelson* is an internal line of timbers which are fitted on the floors immediately over the keel, its principal function being to secure the *ribs* or *frames*. These are composed of the most durable varieties of timber, and according to the class of wood used in the frames and other principal parts of a vessel, the classification in Lloyd's Register is determined. The most approved timbers for frames are oak, teak, sâl, mora, and greenheart. Two sets of timbers are distinguished in the frame, called respectively the 'frame' and the 'filling-frame' timbers. As the ribs are built up of several pieces, the ends or butts of these alternate sets are so arranged that they terminate at different heights, thus giving play or shift to each other. The separate pieces are known as 'futtocks,' the butts or ends of the frame futtocks being called 'heads,' and the butts of the filling frame timbers are distinguished as 'sirmarks.' For receiving and supporting the beams which extend transversely from side to side of the vessel, stout longitudinal beams are worked around the inside of the vessel. These beams are called *shelf-pieces*, and in addition to accommodating the beams, they are themselves of great importance as longitudinal ties and struts. The *beams* are primarily intended for carrying the decks, and they are always made to curve upwards towards the centre, whereby something of the strength and rigidity of an arched structure is obtained, and a convenient means of running water to the *scuppers* is secured. The beams also perform a most important function in acting as shores or struts to prevent the sides of the vessel from collapsing, and as ties to keep them securely knit to each other. Having these important offices to perform, and being subject to numerous and complex strains, the modes of connecting the beams to the sides require careful attention, and there are various methods by which these connections are made. *Carlings* are fore-and-aft pieces which stretch between two whole beams, for receiving the ends of half beams, or such as, owing to the presence of hatches and other openings, cannot stretch from side to side of the vessel. At the bows of the vessel the two sides are connected by *hooks* of timber or iron, which act both as struts and ties according to the circumstances in which the hull is placed. Thus when loaded and immersed in water the sides tend to collapse by external pressure, which is resisted by the hooks internally. On the other hand, when the ship is grounded or in dock, the sides tending to fall apart are tied together by the hooks. The skin or sheathing of the entire vessel, both internal and external, is called the *planking*, and it is put on in continuous *strakes* or lengths, extending from stem to stern. The planks are worked on the sides either in parallel breadths called straight-edged, or in combinations of two strakes, the broad end of the one so fitting to the narrow end of the other, that in combination the two make a combined strake of equal breadth. The upper strakes are termed 'sheet strakes,' and the strake on each side of the keel which fits into the rabbit or inclined plane cut in that timber are called the 'garboard strakes,' and occupy an important place in the structure. At certain points where increased strength of planking is desirable, the thickness of the strakes of planking is materially increased. The internal planking of the hold is termed the ceiling, and the strakes on each side of the keelson are called the limber strakes, and here bilge and any leakage water accumulates so that it may be pumped away. The planking is sometimes secured to each rib or frame over which it passes by one fastening, sometimes by two, or by one and two alternately, the best fastenings being screw trenails with bolts at the butts or ends. The decks, in addition to their office of serving as floors or platforms, add materially to the strength and compactness of the structure, by acting both as ties and struts. They are laid as far as possible in continuous longitudinal strakes, and especial strength of material and fastening is given to the outer-edge strakes, which are generally made of thick planks of hardwood, carefully dowelled and bolted to the beams. After the planking is finished, there remains the important work of *caulking*, which consists of beating oakum with a caulking-iron into every joint in the hull, thereby rendering it thoroughly water-tight, while securing a certain elasticity under strain. The caulked seams are protected with a coating of pitch or of marine glue, a compound of india-rubber and shellac dissolved in naphtha, and the hull is further protected by thin plates of Muntz's sheathing metal, a modified form of brass.

Iron S.—The use of wood for the construction of ships is now being rapidly superseded by iron and steel. In the United Kingdom, indeed, the yards in which wooden ships are now exclusively built are few and unimportant. The art of rolling iron plates such as are used in the building of ships was not developed till 1784, and about 1787 a canal barge of iron was constructed. About the year 1812 such iron barges were in common use on the Staffordshire canals. In 1816 the *Vulcan*, the first iron vessel built in Scotland, was launched on the canal at Monkland. In 1822 the *Aaron Manby*, an iron steamer, was built in sections, put together in London, and steamed to Havre and Paris. The first iron-built vessel classed at Lloyd's was the *Ironsides*, 271 tons register, built at Liverpool in 1838; but she was simply registered as 'built of iron,' and had no letter attached. The same method of registration continued in force till 1844, after which vessels were registered A1, &c., 'built of iron,' with a limit of six years to the duration of the class. In 1857 a special registration was adopted, whereby the designation of class by years was abolished. Thus it may be said that the suitableness of iron for S. has been known for about fifty years, but it is only recently that it has come to be extensively used. In addition to the necessity for overcoming prejudices against a system which had prevailed from the earliest ages, it must be remembered that while wood has been increasing in price and becoming scarce, improvements in the manufacture of iron have

enormously cheapened its production, and rendered it available for many purposes to which in earlier times it could not profitably be devoted.

The superiority of iron to wood as a material for S. is due to many causes. It is cheaper; an iron ship is stronger, and more durable; its carrying capacity is greater, and it is more easily put together than a wooden vessel; moreover, the supply of raw material is more certain and more equal in quality. The only disadvantage, indeed, of an iron ship is the readiness with which its bottom fouls by the adherence of marine organisms, a minor drawback for which no effectual remedy has yet been found.

In an iron ship, ribs of angle iron and rolled iron plates like boiler plate take respectively the place occupied by the timbers and planking of a wooden vessel. A good deal of diversity of opinion and practice exists as to the best forms and methods of combining these in the structure, some advocating light ribs and strong plates, while others are in favour of making the ribs comparatively stronger than the skin of plating. The late Dr. Fairbairn was a powerful advocate of strong ribs and frames, which he held to be essential for the rigidity and strength of the hull, as well as to give a secure basis on which to rivet the outer plates. Looking on an iron-ship as one great girder, he also strongly advocated the cellular construction of the frame vessels, whereby a double bottom is secured, giving great strength to resist compression, and making the ship what is known technically as unsinkable. The riveting or jointing of the iron plates is a subject of great importance, as on that depends to a large extent the power of the structure to withstand the varied and complex strains to which it is subject. At the present time builders are gradually and cautiously feeling their way towards the substitution of steel plates and ribs for the iron now used in building, and it is certain that the improvements which are being effected in steel manufacture, both as regards economy and certainty of material, will have the effect of greatly increasing the use of mild steel in future for all vessels in which strength combined with lightness and speed is desiderated.

Composite S.—By a composite ship is generally understood a vessel in which ribs and other framework are of iron, covered with the planking of an ordinary wood vessel. To increase the strength of the frame in such ships, two longitudinal stringers of iron are run around both sides at considerable distances apart, and these are tied by a series of diagonal plates or stays. Dr. Fairbairn is of opinion that the two materials are seldom united in the constructive arts with any degree of advantage, especially in cases where great strength is required; and more particularly in constructions which have to contend with forces calculated to tear them asunder. Mr. M'Laine, of Belfast, advocates precisely the reverse of the ordinary procedure in composite S., considering that it is 'a mistake to retain only the comparatively useless iron frame in composite vessels; and that it is much simpler, and more in accordance with correct principles, to retain the iron skin to give strength to the composite structure.' Vessels so constructed, Mr. M'Laine holds, would combine all the good qualities of both iron and wooden vessels, and would, in some respects, be much superior to either. In the opinion of Dr. Fairbairn, M'Laine's system gives the best combination of wood and iron applied to the construction of ships; but at the same time he regards it as inferior to and more expensive than his system of double-bottomed iron S.

Other details regarding the construction and fitting of vessels will be found under ARMOUR-PLATES, LAUNCH, MAST, NAVIES, NAVIGATION, SAIL, WAR-SHIPS, &c. See Murray's *S. and Steamships* (1861); Scott Russell's *Modern System of Naval Architecture* (3 vols. 1865); Fairbairn's *Treatise on Iron S.* (1865); Rankine's *S., Theoretical and Practical* (1866); Lissignol's *Navires en Fer à Voiles* (1866); Grantham's *Iron S., with Practical Illustrations* (*Atlas of Plates*, 1868); Reed's *S. in Iron and Steel* (1869); Smith's *Handbook of Iron S.* (1869); Thearle's *Practical Naval Architecture* (post 8vo, and plates, 4to, 1878); and the *Transactions of the Institution of Naval Architects.*

Ship'ka, a village of Turkey, on the S. declivity of the Balkan range, 1798 feet above the sea, and 5 miles W.N.W. of Kasanlik, has 800 Bulgarian houses and two churches. The chief occupation is rose-growing, for the manufacture of rose-oil. S. gives its name to the **S. Pass**, 2938 feet (according to Barth) above it, reached by a steep path nearly impassable for carriages. From the pass a more gradual road (4½ hours' ride) leads 9 miles N. to Gabrovo (1300 houses), 839 feet lower. It was the scene of desperate and bloody struggles in August and September 1877, between Suleiman Pasha and a Russian force which had seized it after crossing the Balkans (14th July) by the Hainkoi Pass, and suffering defeat at his hands at Eski Sagra. In a vain endeavour to force the pass, the Turkish general threw away the lives of more than 20,000 veterans.

Ship'-Money. In 6134 Noy, the Attorney-General, furnished Charles I. with a way to raise an extraordinary supply without the consent of Parliament, viz., by the imposition of a tax upon the port-towns for the provision of ships to guard the seas, and upon the maritime counties for their equipment. His precedents, unearthed from the Tower records, dated from the days when no standing fleet existed, but when the seaports had lent ships for the protection of the country from invasion. However, in 1635 the King sent out writs for S.-M. all over the kingdom, precedents being now abandoned, and Laud having resolved to derive a permanent revenue from the conversion of S.-M. levied on maritime districts into a tax imposed by the royal prerogative on the entire country. Not above £200,000 was raised in 1636 from the tax, which met with strong opposition, and the refusal of Hampden (q. v.) to pay the twenty shillings at which he was rated was one of the proximate causes of the Great Rebellion. The Long Parliament annulled the judgment in his case, and declared S.-M. illegal, in November 1640. See Gardiner's *Personal Government of Charles I.* (vol. ii. Lond. 1877).

Shipp'ing Act. See MERCHANT SHIPPING ACT.

Ship's Hus'band, the owners' agent in the management of a ship, often himself one of the owners. His duties are to keep the vessel in repair and ensure her seaworthiness, to see her properly manned, to attend to her freightage and especially to her provisioning, to look after her papers, and in general to see her properly and efficiently equipped.

Ship'-worm. See TEREDO.

Ship'wreck, Laws Affecting. See DERELICT, FLOTSAM, JETSAM, JETTISON, AVERAGE, WRECK, AND SALVAGE.

Shiraz', a celebrated Persian city lying in a fertile and well-cultivated plain, 494 miles S.S.E. of Teheran, and 165 miles N.E. of Bushire by road. It is over 3 miles in circumference, and is surrounded by a dry ditch and a low wall of mud, flanked with semicircular towers, and pierced by six gates. Its mosques, covered with lacquered turquoise blue tiles, and surmounted with lofty domes and minarets, give it a highly picturesque appearance. S. has 15 mosques, 11 colleges, 14 bazaars, 13 caravanserais, and 26 public baths. Its principal bazaar, the Bazar-i-Wakil, built by Kerim Khan, is the finest in Persia. It is a quarter of a mile long, and is built of yellow bricks arched at the top. S. has several fine mausolea, among them that of Hafiz, outside the walls. The *ark* or citadel of the town, the residence of the Beglerbeg of Fars, is a fortified square of 80 yards. In the vicinity are many beautiful gardens, the most famous of which is the Jahan Numa ('Epitome of the World'), with fine cypress trees. S. enjoys a delicious climate. It is surrounded by extensive vineyards and gardens. The chief exports are silk, cotton, glass, earthenware, wine, and extract of roses. Pop. (*Almanach de Gotha* for 1878) 30,000. S. was founded during the 7th c., and was a favourite residence of the early sovereigns of Persia. It was improved by Kerim Khan, and in his reign had 10,000 houses and a pop. of 50,000. In 1810, however, when visited by Sir John Malcolm, its pop. was only 20,000. In 1812 and in 1824 it was almost ruined by earthquakes, 4000 persons having perished on the latter occasion; and again in 1853 it was almost entirely destroyed, when upwards of 10,000 persons perished. S. was the birthplace of the famous poets Hafiz (q. v.) and Saadi (q. v.).

Shire, the English equivalent of the Norman County (q. v.), is derived from the Old Eng. *sciran*, 'to divide.' Whether in England the Mark (q. v.) ever possessed the same autonomy as on the Continent, is doubtful. Certain at least it is that with constant Welsh raids to be repelled, and fresh invasions to be

undertaken, the marks must have been connected by military confederations, and such connection growing gradually closer, the shires arose out of their amalgamation, just as later these shires, each governed by its own Ealdorman (see EARL), coalesced into kingdoms under a single king. That the process was a gradual one is proved by the nomenclature. For while the W. Saxon shires still bear the original titles of the principalities founded by Cedric's successors (Wilsætas, Dornsætas, Sumorsætas, &c.), in Mercia the case was otherwise. There, at a date subsequent to Ælfred's reign, the earlier names were replaced by others derived from towns—Cheshire from Chester, Staffordshire from Stafford, and so on. Shropshire, as being rather cognate with than derived from Shrewsbury, may be regarded as an exception, and Rutland is not so much as cognate with any town; but then it does not figure in *Domesday* as a separate S. These considerations, and the fact that while the Wessex shires adhere to the ancient boundaries, these have in Mercia been frequently obliterated, lead to the conclusion that the Mercian shires were artificially mapped out either by the Danish conquerors of the 9th c., or more probably by Eadward the Elder (901-925). Chief among the officers dispersed throughout a S. to attend to the royal interests stood the Scirgerefa, Shire-reeve, or Sheriff (see GRAF), the king's immediate agent and representative. He it was who levied dues, fines, and amercements; to him the regal writs were addressed, and he, in the Ealdorman's absence, or, after the Norman Conquest, in his stead, presided over the hundred and S. courts. The latter were left unchanged by the judicial reforms of the Plantagenets. In them the knighthood, yeomanry, and husbandmen of the S. gathered around the sheriff, as he heard appeals from the hundred or soke courts, published the king's writs and demands of aid, assessed the local taxation, and received the presentment of criminals and inquests. In the S. court the sheriff summoned the lesser barons to the Great Assembly, and in the constitution of the S. court, with its twelve sworn deputies from every hundred, the germs may be discovered of the modern representative system of Parliament (q. v.). At present the sheriff's duties—of 'life of justice' (returning juries), of 'life of the law' (executing judgments), and of 'life of the commonwealth' (preserving the peace of the S.)—are mainly performed by a deputy, the under sheriff. At a meeting presided over by the Chancellor of the Exchequer and held on the 12th November, the judges give in the name of three fit persons for each county, and unless good cause be shown for exemption, the first name on the list is selected. Then the list having been reconsidered at a Cabinet meeting on 3d February, the Queen in Privy Council pierces it with a punch opposite each of the names of the sheriffs-elect, this ceremony being termed 'pricking for sheriffs.' A penalty of £500 attaches to refusal to serve, except in cases of proved disability. See Kemble's *Saxons in England* (vol. i. pp. 77-84), and Freeman's *Norman Conquest* (vol. i. chs. ii.-iii.).

Shiré, a river of S.E. Africa, issues from the southern end of Lake Nyassa (q. v.), and joins the Zambezi after a southerly course of 250 miles. In its upper course the S. is from 9 to 15 feet deep, with very little current, but from 15° 50′ S. lat. it descends 1200 feet in 35 miles by five cataracts, which interrupt navigation. Below these the S. is 12 feet deep and 150 yards broad, with a 2½ knot current.

Shir'ley, James, an English dramatist, born in London, September 13th, 1596, was educated at the Merchant Taylors' School, and at St. John's College, Oxford. He graduated at St. Catharine's Hall, Cambridge, took a cure near St. Albans, and subsequently turning Romanist, resigned his living to teach in St. Albans Roman School. Then he became a playwright in London, and had written in all 33 pieces before 1642, when Parliament suppressed theatres. During the civil wars S. aided the Earl of Newcastle with pen and sword. Returning to London, he gained subsistence once more by teaching, but he and his wife were driven from their Fleet Street home by the Great Fire, and both perished from fatigue on the same day, October 29, 1666. S.'s style is rich and strong. He was only nine years old when Elizabeth died, yet he is usually ranked with the great Elizabethan dramatists, whose intellectual characteristics he possesses. While the licence Charles II. inaugurated did not tempt him to resume the pen, and while his view of humanity is higher than that of the Restoration wits, he occasionally rivals them in filth. *The Traytor*, *The Lady of Pleasure*, and *Hide Park* are S.'s finest plays; but he himself called *The Cardinall* 'the best of his flock.' Gifford and Dyce edited S.'s works, in 6 vols. (Lond. 1833).

Shirt (Old Eng. *sceort*), a familiar article of male attire, was first worn in England during the pre-Norman period, linen being the material of which it was made. Woollen shirts were introduced later, and in the 10th c. the wearing of one was reckoned a severe form of penance. Silken shirts were in use in Chaucer's time, while during the 15th and 16th centuries shirts of fine lawn, richly embroidered on the collar, front, and wrists, were the fashion, and for their display the doublets were worn low-necked and 'slashed' in the arms. In Charles II.'s reign much of the S. was shown, and then it was common to ornament it with cut-work representing historical and religious subjects.

Shir'wa, or **Taman'dua**, a lake of S.E. Africa, 30 miles S.E. of Lake Nyassa (q. v.). It is pear-shaped, 60 miles long, from 10 to 23 miles broad, and 1800 feet above the sea-level, lying in a basin formed by mountains which rise in some parts to a height of 7000 to 8000 feet. The lake receives several streams, but has no outlet, and is brackish.

Shis'dra, a town of Russia, government of Kaluga, on the S., a feeder of the Ugra, 37 miles E.N.E. of Briansk. It manufactures oil, woollens, glass, leather. Pop. (1870) 11,703.

Shis'hak (Egypt. *Shashanga*, Heb. *Shishag*, and Gr. *Sousakim*), the name of several Egyptian monarchs of the twenty-second dynasty, of whom the first and most remarkable, a Semite by race, united Egypt under one government, but failed to conquer the Ethiopian rulers of Napata. Jeroboam took refuge at his court, and in the fifth year of Rehoboam (962 B.C.) S. overran Judah, and plundered the temple and palace of Jerusalem (1 Kings xiv. 25; 2 Chron. xii. 2-9). The Portico of the Bubastites, in the temple of Karnak, is inscribed with the names of 130 cities captured by S.

Shitt'im Wood, of which the Ark of the Covenant was constructed, is generally considered to have been the wood of some species of *Acacia*. Some suggest the African and Arabian variety of *A. Arabica* (*A. nilotica*), and others *A. Sevel* of the Libyan and Nubian deserts.

Shive (Low Ger. *schive*, 'anything round an flat') signifies a flat round cork or bung.

Sho'a, the most southerly division of Abyssinia (q. v.), of which it is now independent. Its boundaries, especially on the W. and S., are very variable. S. is mountainous, well watered, fertile, and populous. The capital is Ankobar (q. v.).

Shock and Collapse'. The condition called shock or collapse is described as follows by Mr. Savory,—'The patient lies in a state of utter prostration. There is a striking pallor of the whole surface, most marked from its contrast to the natural colour of the face; the lips even are quite pale and bloodless. There is a cold, clammy moisture on the skin, and often distinct drops of sweat upon the forehead. The countenance has a dull aspect, and appears shrunken and contracted. There is remarkable languor in the whole expression, and especially in the eye, which has lost its natural lustre, and is partially concealed by the drooping of the upper lid. The nostrils are usually dilated. The temperature is considerably reduced, and if the person be able he will complain of cold, and perhaps shudder. Muscular debility is extreme, apparent at a glance in the condition of the lips and hands, occasionally even in the relaxation of the sphincters. The pulse is generally frequent, sometimes irregular, always very feeble, perhaps imperceptible. In this latter case, although the ear may detect the fluttering action of the heart, the pulse does not reach the wrist. The respiratory movements are short and feeble, or panting and gasping, wanting the relief of sighs, sometimes imperceptible, although in the majority of such cases some action of the diaphragm may be detected by careful observation. Vertigo, with dimness of vision, supervenes. As a rule there is not complete insensibility, although there is much variability in this respect, depending, no doubt, on the nature of the injury; but the person is drowsy and bewildered, yet conscious, and perhaps rational, when roused. Sometimes the intellect is singularly clear and the senses perfect,

the hearing occasionally painfully acute. In the less extreme cases there are often nausea and vomiting with hiccough. The last is very variable in its occurrence.'

S. or C. may be caused by great mental emotion, hæmorrhage, violent injury, especially of the abdominal viscera, the large joints, &c.; severe pain and certain poisons; and in such cases the shock may be so great as to prove fatal at once.

Treatment.—The first care of the surgeon is the avoidance of immediate death in the first shock; and for this purpose, warmth is one of the most essential requisites. Towels wrung out of hot water should be bound round the head, or hot effusions should be employed, and hot fomentations should be applied to the epigastrium and the extremities. Galvanism over the præcordial region is valuable as a remedial agent; ammonia should be applied to the nostrils; and brandy, in small quantities, should be given by the mouth or rectum. Transfusion (q. v.) should be practised if the heart is acting, though the patient seems otherwise dead, and the efforts at revival should be practised for a considerable length of time. See Holmes' *System of Surgery*, vol. i. pp. 765, *et seq.*

Shodd'y is the name given to the wool obtained from worn worsted goods, as flannels, stockings, blankets, &c., by tearing them to separate fibres in a 'devil machine,' which contains a revolving cylinder armed with numerous spikes. Hard and fine woollen rags, and new cloth clippings and shreds similarly operated on, yield 'mungo,' and 'extract' is the residue of mixed wool and cotton rags after the cotton has been destroyed by a chemical process. From these varieties of refuse wool, especially S. and mungo, a great variety of cheap fabrics are manufactured, new wool being spun with the old wool. The fabrics themselves, most of which have cotton warps, receive the general name of S. The first attempt to utilise S. was made about 1813 in Yorkshire in the production of the meanest class of all wool goods. The manufacture made slow progress till 1834, when the use of mungo was introduced, and the successful application of this short-stapled wool, together with the introduction a few years later of cotton warps, gave an immense impetus to the S. cloth industry, which now ranks as one of great importance and prosperity in Great Britain. The West Riding of Yorkshire is the seat of the industry, Batley, Dewsbury, and other towns being wholly devoted to it. The total quantity of material, formerly waste, now utilised in this manufacture cannot be far short of 100,000,000 lbs., a considerable proportion being drawn from foreign sources.

Shoe Manufacture. The original form of covering and protection for the human foot was probably the sandal, which is still worn by the natives of southern countries. In its simplest form, it consisted merely of a sole attached to the foot by leathern belts or thongs. From this the various kinds of shoes and boots have been gradually developed, and though foot-coverings were much less important among the ancient Greeks and Romans than among the nations of the present day, several varieties were distinguished. Thus the *solea* or *soccus* was little more than a sandal, with the addition of a covering at the point for the toes. The *caliga* was the sandal of the common soldier; the *calceus*, a kind of shoe, was worn by superior officers. The form and colour of the *calceus* indicated the rank of its wearer, and of those worn by senators, a kind called *mullei*, from resemblance to the scales of the red mullet, were much admired. Some of these shoes also were made of 'tawed' or alumned leather, and called *alata*. The *pero* was a boot of raw hide worn by rustics and labourers, and the *cothurnus* a boot sometimes laced up to the knee, and specially affected by actors, horsemen, and hunters. For the races inhabiting more rigorous climates than those of Greece and Rome, the open sandal would not present a sufficient protection to the feet, and a kind of mocassin of undressed hide was used by the early Britons. For a brief notice of the subsequent changes in the form of this part of covering, see article Boots. Since their introduction, indiarubber and guttapercha have been variously utilised in the manufacture of boots and shoes. The Sabot (q. v.) is still extensively used in several European countries.

Shoemaking was formerly entirely a domestic handicraft, and to a considerable extent is so still. But within the present generation machinery has been largely adapted to boot and shoe manufacture, and the industry now ranks among the extensive and important factory occupations. In 1871 there were in Great Britain and Ireland 281,455 persons engaged in shoemaking; and in 1875, 147 factories, with 3547 sewing-machines, employed 18,418 hands. The chief seats of this industry in Great Britain are Leicester, Stafford, Ipswich, Northampton, Newcastle-under-Lyme, Maybole; in the United States, Lynn, Haverhill, Marblehead, Worcester, and Danvers in Massachusetts; Portland, Augusta, and Lewiston in Maine; Dover and Farmington in New Hampshire. Lynn alone in 1874 produced 11,000,000 pairs, valued at $14,000,000; Boston, the centre of the wholesale trade, in the same year exported 55,000,000 pairs. France exports to England and other countries large quantities of ladies' boots. The exports from Great Britain in 1877 amounted to 5,243,992 pairs, of which Australia took 2,491,512 pairs. The following are the four principal systems pursued in the manufacture. 1st, Hand-sewing; 2d, Pegging; 3d, Riveting; and 4th, Wax-thread machine-sewing. The first—hand-sewing system—is the old handicraft method by which the best and most durable work, but at the same time the most costly and tedious, is produced. In all kinds of shoemaking two distinct branches of the work are recognised; the making of the 'uppers' or 'vamps,' the portions above the foot, and of the sole or under part of the boot. The stitching of uppers is generally done as a separate branch of the trade, and while hand-sewing entirely prevailed, 'closing,' as the work was called, was frequently done by females. On the introduction of the sewing-machine it was utilised for the stitching of the uppers of even the highest class of hand-made boots. The sole of a shoe consists at least of two sections, the insole, which lies within the lower edges of the upper leather, and the outsole, which is variously fastened as indicated in the above classification. The insole is tacked to the under part of a wooden last; it is then pared down, and holes pierced around its sides for subsequent sewing. The upper is then drawn over the last and tacked above the sole; a welt, or narrow band of leather, is taken, and welt, upper, and insole are all sewed together. Subsequently the outsole is sewed to the welt, the heel is put on, the edges trimmed, blackened with copperas, polished with hot irons, and so finished. The shoemaker works at a low stool in a constrained, unhealthy attitude, and at his side is a tray containing his knives, awls, pincers, thread, rosin, lapstone, iron-last and other tools.

The systems of pegging, riveting, and wax-thread sewing prevail in factory shoemaking, and by all these plans a great deal of the labour involved in hand-sewing is avoided; but the work is less elastic and strong. In factory work the cutting out of the various parts is done by machinery. The edge of the upper is carried well over the insole, and upper, insole, and outsole are connected and secured together by one operation; in the case of 'pegging,' wooden pegs are used; in riveting, brass rivets scored on the sides to give them grip are employed; and in wax-thread sewing the thread is passed through and through by means of a modified sewing-machine having a hook instead of a needle, and a secure lockstitch is formed.

Shoeing of Horses. See Horse-Shoeing.

Sho'la (Vern. *Sola* or *Phūl-Sola*) is a large perennial leguminous water-plant named *Æschynomene aspera*, abundant in tanks and marshes in Bengal and other parts of tropical Asia. The thick stems are mainly composed of light white pith, which is made into floats, toys, swimming-jackets, and the Solah hats or helmets—invaluable as a protection against the sun in hot countries.

Sholapore', the chief town of the district of the same name in the Bombay Presidency, British India, 283 miles S.E. of Bombay by rail. Pop. (1872) 53,403. It has grown with the growth of the cotton trade. The houses cluster round a fort, which was captured by the British in 1818, when this tract of country was acquired from the Peishwa. The *district* of S., which was formed out of Poonah in 1838, lies between the Nizam's Dominions and Sattara. Area, 3925 sq. miles; pop. (1872) 662,986. It is a hilly country, forming part of the Deccan or central plateau of India. The food crops are millets, pulses, and a little wheat; but cotton is the staple of commerce. Weaving is largely carried on in the towns. This tract suffered more than any other part of the Bombay Presidency from the famine of 1877. The cattle especially died in large numbers, and only one-fifth of the revenue could be collected within the year.

Shore. See Sea.

Shore, Sir John (Lord Teignmouth), was born in Devonshire, October 8, 1751, went out to India in 1769, and rapidly rose in the service of the East India Company. Like Warren Hastings, he was a student of the Oriental languages and a sympathiser with the native character, and under Lord Cornwallis he was mainly instrumental in effecting the Permanent Settlement (q. v.). He held the high office of Governor-General from 1793 to 1798, and previous to his retirement was raised to the peerage as Lord Teignmouth. His term of government was only marked by the mutiny of the Bengal European officers, and the assassination of the Resident, Mr. Cherry, at Benares. His policy was opposed to interference with the Native States. In 1804 he published *Memoirs of the Life, Writings, and Correspondence of Sir William Jones*. In 1807 he edited the *Works of Sir William Jones, with the Life of the Author*. After his return to England he became a conspicuous member of the 'Clapham Sect,' and was the first president of the Bible Society. He died at London, February 14, 1834. See his *Life and Correspondence* (2 vols. 1843), by Charles John Lord Teignmouth, whose *Reminiscences of Many Years* appeared in 1878.

Shore'ditch, a metropolitan parish in the parliamentary borough of the Tower Hamlets, 1½ miles N.E. of St. Paul's, covers 648 acres, and in 1871 contained 15,599 houses, with 127,164 inhabitants. Of these the manufacture of boots employed 2685, of upholstery 2571, of watches 396, of engines 375, of brushes 357, of saddles 242, and of silk (a survival from the Huguenot immigration) 224.

Shore'ham, New, a seaport of Sussex, 6 miles W. of Brighton by rail, stands at the mouth of the Adur, which is spanned by a good suspension-bridge (1833). The Norman and Early English parish church has been recently restored; a Roman Catholic church was erected in 1875; and St. Saviour's School, a branch of Lancing College, was opened in 1858. The harbour, though only tidal, was entered in 1877 by 784 vessels of 92,425 tons, and cleared by 460 of 32,222 tons; while on December 31 of that year 140 steamers and sailing-ships of 29,009 tons were registered as belonging to S., besides 307 fishing-boats. The imports amounted (1877) to £406,913; the exports to £3792; and the customs to £2152. Oyster and other fisheries employ 821 persons, and the shipbuilding yards turned out 21 British vessels of 2168 tons during the years 1873-77. Pop. (1871) 3678; of the parliamentary borough, which returns two members and includes 41 parishes, 37,984.

Shores (Dutch *schoor*, Ger. *schore*, Icel. *skorda*), in ship-building, strong props placed under the 'wales' of a ship's bottom, to keep the vessel steady on the slips. Timbers used to prop up walls are also called S.

Short'hand, an art by which writing is abbreviated, so as to keep pace with speaking. Its great and general utility has been recognised in every age, and numberless systems have been devised to facilitate its acquirement. It was practised by the ancients for its secrecy as well as for its brevity, and a work is extant on the art, which is ascribed to Tiro, the freedman of Cicero. The first English treatise on stenography, in which marks represent words, was published in 1588 by Timothy Bright, M.D., under the title, *Characterie; an Art of Short, Swift, and Secret Writing by Character*. In 1602 appeared *The Art of Stenography, or Short Writing by Spelling Characterie*, by John Willis. Notwithstanding the intricacy of this system, in which 'arbitraries' are extensively used, it became popular and found many imitators. It was succeeded by the systems of Edmond Willis (1618), Henry Dix (1641), and Jeremiah Rich (1659), the last taught in Dr. Doddridge's academy at Northampton, and described by Locke as 'the best contrived I have ever seen.' In 1672 appeared *A Pen plucked from an Eagle's Wing: or, The most swift, compendious, and speedy Method of Short Writing*. The author was William Mason, the most famous shorthand writer of the 17th c. His alphabet was formed from Rich's, by altering the signs for six letters, viz., *g, h, j, o, r, w*. In his 2d ed. (1682), Mason altered the alphabet so as to leave only six of Rich's letters; and the 3d ed. (1707) left only five, viz., *e, o, v, w, y*. Gurney, who published his system in 1753, took for his alphabet the signs in Mason's 3d ed., the first six letters of which are

a, b, c, k, d, e, f.

His vowels, when final, were written, *a* and *e*, at the top of the last consonant; *i* and *y* at the middle; *o* and *u* at the foot.

Medial vowels are written by lifting the pen and writing the next consonant at the upper part of the preceding one for *a* and *e*; in the middle for *i* and *y*; and at the bottom for *o* and *u*. Initial vowels are written by their alphabetic characters. Mason's direction (in which he is followed by Gurney and all authors of *a, b, c* shorthands), to 'write words completely according to their sound,' means, as Mr. Pitman observes in his *History of S.*, 'let each vowel represent as many different sounds as it does in the common spelling; and, for two or three vowels coming together, write the one that will most nearly represent the sound, according to the general use of such vowel character;' or, as Mason himself expresses it, 'if a diphthong or two vowels come together in one syllable, set what [consonants] follow in that vowel's place which bears the greatest sound;' thus, the *ea* of *meat* would be considered as an *ee*, and the *ea* of *great* as an *a* (pate, pain), still leaving it doubtful whether the letters *m, e, t* were to be sounded *meet* or *met*, and *g, r, a, t*, *grate* or *grat*. In 1767 was published the system of Dr. Byrom, four years after his death, which, however, had been completed as early as 1720. This was in many respects an admirable system—characterised by 'simple strokes and no arbitrary characters.' In 1785 Dr. Mavor published his *Universal Stenography*, an ambitious improvement on Byrom. His alphabet consists of 18 letters, two of which are for the vowels. The characters for the vowels are a dot (.) and a comma (,). The comma in different positions indicates *a, e, i*; the dot, *o, u, y*. In 1786 appeared the famous system of Taylor, which was almost universally used previous to the publication of *Phonography* by Mr. Pitman in 1837. Taylor has 22 marks or characters: of these, 16 represent the alphabet; the remaining 6 standing for *ch, sh, th, ious, etc., viz.* There are twenty rules to be observed, but of these, eighteen are elaborations of the first two, which are (1) Spell by sound, (2) Vowels are used only at the beginning or end of a word. This system was adapted to the French language by Bertin in 1792, to the Italian by Emilio Amanti in 1809, and to the German by Danzer in 1801, and Berthold in 1819. In 1823 Harding issued an improved edition of Taylor's system, which was much used. In 1812 Lewis published an ingenious system, the alphabet of which was good, though the rules were somewhat complicated. Its chief faults were double letters, such as BL and ST, and symbolical characters. Hunter's *System* (1819), is noted for the ease with which its characters may be correctly formed. In 1837 appeared Pitman's *Phonography*—the first really popular system of S. Melville Bell, following in the path marked out by Pitman, founded his system on the sounds of the language. The first sketch appeared in 1849; in 1852 the first complete edition, under the title *Semi-Phonography*. An improved edition was published as *The Reporter's Manual* in 1857, from which we take the alphabet, comparing it with Pitman's alphabet of Phonography—

BELL'S—*k g* — *t d* — *ch j* — *p b* — *s z*
sh zh — *l* — *f v* — *m* — *n* — *h r*
th th (dh) — *wh* — *ng* o

PITMAN'S— *p b* — *t d* — *ch j* — *k g*
f v — *th th (dh)* — *s z* — *sh zh*
l — *r* — *m* — *n* — *ing* — *w* — *y* — *h*

Bell's letters are written in three sizes; full size, as above, half size, and 'tick' size. Pitman makes his letters of two lengths only, full size and half size (the half-sized letters expressing an additional *t* or *d*). Vowels are expressed in Bell's system by the following rule, which does not distinguish one vowel from another: '*Full*-sized characters are used when a *vowel precedes* the consonant, *half*-sized when no vowel precedes and a *vowel follows*, and *tick*-sized instead of half-sized in all combinations.' Exact vowel marks are, however, furnished, and are recommended to be employed in the writing of foreign words and proper names. They are written opposite the top or bottom of the consonant, thus:

(Top) *eel, ale, an, up, urn, ah, pull, pool, isle, oil*
Symbols: • — ׀ ɔ v ʌ > <
(Bottom) *ill, ell, ere, ask, err, on, all, old, ore, owl, mule*

Pitman's vowel signs are—

ah, · | – *aw*, *ei* or *ī*, v | ˥ *oi*.
eh, · | – *oh*,
ee, · | – *oo*, *ow*, ʌ | ^ *ew* or *ū*.

They are used thus: a dot is placed at the beginning of a consonant to represent *ah*, in the middle of a consonant for *eh*, and at the bottom for *ee*; and so with the short strokes for *aw*, *oh*, and *oo*. The vowel sign is written heavy to represent a long vowel, and light for a short one, the vowels being paired according to their sounds. There are no short powers to the four diphthongal sounds. The principal point of difference in the two systems is, that Bell subordinates his S. alphabet to a theory of sounds which is strictly correct; and Pitman, while acknowledging the principle of a phonetic representation, consults the convenience of the writer in the selection of signs. For example, the broad distinction of voice and breath consonants was first marked by Pitman by the happy expedient of writing heavy strokes for the voice letters *b*, *d*, *j*, *g*, *v*, *th* (in *th*en), *z*, *zh*, and light strokes for the breath letters *p*, *t*, *ch*, *k*, *f*, *th* (in *th*in), *s*, *sh*. Bell adopted the same principle. 'Those articulative actions,' he observes in his 1st ed., 'which are used without voice, the *breath* articulations, are, as in Mr. Pitman's *Phonography*, denoted by a *thin*, *light* marking of their appropriate symbols. In this way the eye is at once informed of the most important literal relationships, and of those organic identities which reduce the simple actions of speech to but little more than half the number of their representative letters.' Five of the articulations that make up our composite speech exist in English only in the *voice* form, namely, *m*, *n*, *ng*, *l*, *r*, but the *breath* forms of *l* and *r* are found in Welsh. No language, so far as we know, employs both the breath and the voice forms of *m*, *n*, *ng*. Bell writes heavy strokes for these five letters, and Pitman light ones, except for *ng*. As heavy strokes require increased exertion on the part of the writer, Bell's system is, in this point, inferior to the other for practical purposes. It is only necessary to observe further that in Pitman's system every frequently occurring word is written by one of its letters for brevity. Such words are called 'grammalogues,' or letter-words. Thus *t* is written for *it*, *n* for *no*, *w* for *we*, &c. Bell's system is far inferior to that of Pitman in legibility and ease of formation. They may be compared in the following sentence, written in both systems, and which may be deciphered with the aid of the alphabets given above.

P

Flung into life in the midst of a Revolution that quickened every

B

P

'energy of a people who acknowledged no superior, he commenced his

B

P

course, a stranger by birth, and a scholar by charity.

B

An ingenious system of S. was published by Moat in 1833, in which the author takes the dot as his basis, 'because all figures must emanate from it,' divides the circle into twenty characters or signs, and introduces 'lines' to mark his vowels with dots. S. is now largely practised both in England and America, and has extended its benefits to many classes besides that of the professional reporter. This is due chiefly to the excellences of Pitman's system and to his activity in disseminating its principles. The existence of two styles of Phonography, one adapted for letter-writing and the other for reporting—the second, however, being only an extension of the first, and not a new system in itself—has been the chief basis of the popularity of Phonetic S. Rejecting Pitman's system on account of its alleged complexity and the difficulties it presents to the student, Matthias Levy (1862), A. H. Thompson (*Stenography*, 1868), and 'A *Times* Reporter,' have recurred to that of Taylor, while Mason's has been adopted by Thompson Cooper (*Parliamentary S.* 1858). The latest modification of Pitman's principles is *S. for General Use*, by Prof. Everett, of Queen's College, Belfast (Lond. 1877). See Levy's *History of S.* (Lond. 1862), Pitman's *History of S.* (Bath, 1868), and *The History and Literature of S.*, by Prof. Zeibig of Dresden (2d ed. enlarged, 1878).

Short'horns. See Ox.

Shot, the general name for solid projectiles, or hollow projectiles without bursting charges. Spheres of stone were fired from the first cannon; lead and iron balls were afterwards substituted. The introduction of rifled firearms has led to the universal adoption of elongated S. and shell, and in the case of the English Palliser S. the same projectile answers both functions, because it is cast hollow, and may be used with or without a bursting charge (see SHELL). Spherical S. of cast-iron are still retained for use with mortars and other smooth-bore ordnance. As cylindro-conoidal S. of ordinary cast-iron were found to be useless against armour plates, chilled iron S. having an ogival head, the invention of Major (now Sir William) Palliser, were selected to replace them. Palliser S. is made of iron of the best brands, cast in a 'chill' (iron) mould instead of sand. The 'chill' imparts intense hardness, owing to the sudden cooling favouring the retention of the carbon in chemical combination with the iron, but at the same time brittleness results. This quality is compensated for by the ogival head, which is the best possible form for the penetration of iron plates. As now practised, only the upper part of the S. is cast in 'chill,' the lower portion being cast in sand. Sand S. consists of small balls of iron cast in sand, and is employed principally in making Case S. (q. v.) and Grape S. (q. v.). Whitworth of Manchester and Krupp of Essen employ steel for rifled S., and from recent experiments in England with ogival S. of home and foreign make, it seems probable that steel, notwithstanding its immense cost, will ultimately supersede the use of chilled iron. Small S. for use with fowling-pieces, &c. is made by running molten lead combined with a little arsenic through a sieve, or pouring it from a ladle with a serrated edge from the top of a high tower (about 180 feet) into water at the bottom. The stream of metal in falling breaks into drops, which become perfectly spherical. The S. is dried and afterwards polished by attrition in revolving cylinders containing some graphite.

Shotts, a large parish in Lanarkshire, comprising the mining villages of Dykehead, Harthill, Salsburgh, Greenhill, and Cleland. Pop. (1871) 8353. But the place best known as S. lies on the Caledonian railway, about midway between Glasgow and Edinburgh, and 11 miles N.E. of Hamilton. Many of the inhabitants are employed in connection with S. iron-works, which were established in the beginning of this century. Coal and ironstone abound in the district. There are five furnaces, one on the old and four on the new system, by which they utilise and consume their own smoke. The principal buildings are the new Free Church, on the neighbouring height, the Commercial Bank, and Calderhead Church. The Kirk of S. is famous as the scene of the Revival in June 1630, under the preaching of John Livingstone. It stands on a bleak height, near the centre of the parish, 3 miles north of the S. railway station.

Shoul'der-Joint, the articulation between the *glenoid* cavity of the *Scapula* (q. v.) or 'shoulder-blade' and the *humerus* or upper arm. The S.-J. illustrates admirably what is meant by an anarthroidal or ball-and-socket joint. The 'ball' is formed by the head of the humerus, the 'socket' being the shallow, saucer-like 'glenoid-cavity' of the scapula. The large head of the humerus working in its shallow socket gives the utmost freedom and mobility to this joint. Displacement is prevented by the arch formed above it by the *coracoid* and *acromion processes* of the scapula, together with the *coraco-acrominal ligament*; while the strong ligaments and tendons surrounding the joint also prevent injury. The articulating surfaces in the S.-J. are covered with cartilage, that covering the humerus being thickest in the centre; while the cartilage of the glenoid cavity is thickest at the circumference. There are *three* chief *ligaments* in the S.-J. The *capsular ligament* encloses the joint, and is attached below to the anatomical neck of the humerus. It is of loose texture, and admits of a large degree of separation of

the bones, and has three openings; one at its inner side, one at its outer border, and one at the lower border for the *long tendon* of the *biceps muscle*. The second is the *coraco-humeral ligament*, which passes from the outer border of the *coracoid process* to the front of the *great tuberosity* of the humerus, where it unites with the tendon of the *supraspinatus muscle*. The third is the *glenoid ligament*, which runs round the margin of the glenoid cavity, protects the bony edge of the cavity, and deepens it for articulation with the humerus.

Diseases and Injuries of the S.-J.—The S.-J. is less frequently diseased than any of the other large joints, and when inflammatory disease does occur, the prospect of recovery is favourable. *Inflammation* may exist for a considerable time without suppuration, but when it does occur, it is often directed by one of the tendons around the joint to a considerable distance, giving rise to doubt as to the origin of the discharge. In cases of inflammation, rest and counter-irritation should be persevered in as long as pain is present, but no longer, as too long confinement is apt to produce rigidity of the parts. In cases of *suppuration* there may be a natural cure by ankylosis, but if the symptoms demand it, the operation of excision may be performed, as it is usually successful. *Osteoarthritis* is rather common in later life, and may be recognised by the crackling in the joint, pain, and change of shape in the parts. *Dislocation* of the S.-J. may take place in one of three directions,—downwards, inwards, or backwards. Dislocation upwards may also take place, but the injury is of very rare occurrence. In every dislocation of the S.-J. there is loss of the natural, rounded shape of the shoulder; a change in the direction of the axis of the humerus; an increase in the vertical measurement of the shoulder; loss of voluntary motion; and resistance to passive movements except in certain directions. For a description of the modes of reduction of the various dislocations of the S.-J., see Holmes' *System of Surgery.*

Shov'el, Sir Cloudesley, an English admiral, born about 1650, of poor parents, near Clay in Norfolk. He entered the navy as a cabin-boy, but had attained the rank of lieutenant in 1674, when, during an expedition to Tripoli to seek satisfaction for outrages on the English in those parts, he was sent by his commander, Admiral Sir John Narborough, with a requisition to the Dey. Twice S. was received with scorn, and the second time sent back without an answer; but from observations he had made he was able the same night to seize the enemy's guardship and burn four other vessels without losing a man. For this feat he was promoted to the command of a ship. Knighted by William III. for gallantry at Bantry Bay, S. in 1692 became Rear-Admiral of the Red. He took part as such in the battle of La Hogue (1694), was Vice-Admiral of the Red in the expedition against Camaret under Lord Berkeley, and in that against Dunkirk held the chief command. He led the van in the battle of Malaga (1704), and took a prominent part in the capture of Barcelona. In 1706 he sailed to Portugal, under Lord Rivers, to aid the king of that country, and the year after joined the Duke of Savoy in the siege of Toulon, but on his voyage home with nine ships of the line he was wrecked off the Scilly Isles, October 22, 1707. A miserable monument marks his tomb in Westminster Abbey.

Shov'eller (*Spatula clypeata*), a species of *Anatidæ* or ducks, having a long bill, with a hooked and very much broadened tip. The average length is from 17 to 20 inches, and the plumage is brown on the back, the head and neck green, and white below, the belly being light brown. The *lamellæ* of the bill are well developed. The S. inhabits Britain in winter. The eggs, eight or nine in number, are of a dirty-white colour tinted with green.

Showers of Fishes, the name given to a curious phenomenon in which fishes of various kinds (*e.g.*, sticklebacks) have seemed to descend from the skies in large quantities. Instances of this kind are most frequent in tropical regions, but they have also occurred in Britain. The only rational explanation of the phenomenon is that they have been caught up along with the water they inhabited in a violent whirlwind, and have been conveyed, it may be, for many miles from their original *habitat*. Fishes have been frequently ejected from the craters of volcanoes; a fact which may be explained on the theory that an eruption is produced primarily by water from lakes or the sea gaining admittance to the interior of our earth and being converted into steam.

Shrap'nel Shell. See SHELL.

Shrew, or **Shrew Mouse** (*Sorex*), a genus and family (*Soricidæ*) of *Insectivorous* quadrupeds, allied to moles and hedgehogs. They are not to be confounded with the common mice, the latter being *Rodentia* (q. v.). The S. mice have hairy bodies, a mobile snout, well-developed ears, and feet adapted for running. Their food consists of insects and their larvæ. The Common S. (*S. araneus* or *vulgaris*) has six upper and four lower incisors; canine teeth are absent, and five small premolar teeth are developed; the molars numbering eight above and six below. The Common S. attains a length of 4 inches, inclusive of the tail. The colour is reddish brown, occasionally tinted with grey. The fur has a musky and somewhat disagreeable odour. The young number four or five, and are born in spring. Shrews are very pugnacious, and are regarded with fear by the ignorant and superstitious. The Water S. (*Crossopus* or *S. fodiens*) attains a length of 4½ or 5 inches. The upper parts are black, and the under fur is white. The tail and feet are fringed with stiff white hairs. The Oared S. (*C. remifer* or *ciliatus*) has the hinder part of its tail broadened and fringed like the blade of an oar. The *Corsira rustica* is the Rustic S. of Ireland and England. The *Sorex Etruscus* of Italy is the smallest known mammal, and attains a length of only 2½ inches. The Elephant shrews form a special family (*Macroscelidæ*), occurring in Algeria and S. Africa, and distinguished by the great relative length of the proboscis. The tail is long and slender, and the nails of the hinder toes are very long. The *Macroscelidus probiscideus*, or common Elephant S. of Southern Africa, and the *M. Rozeti* of Algeria, are the most familiar species.

Shrew Mole (*Scalops*), a genus of *Talpidæ* or Moles (q. v.) inhabiting N. America, and of which *S. aquaticus* is the familiar species. The S. M. attains a length of 7 inches, its colour being a lustrous black. The muzzle is long and has a cartilaginous tip, while the claws of the fore feet are long, sharp, and powerful. The hind feet and legs are short, and the tail is rudimentary.

Shrews'bury, the county town of Shropshire, 42 miles W.N.W. of Birmingham by rail, stands on a promontory formed by a horseshoe bend of the Severn, which is spanned by two bridges, the English Bridge (1774) leading to the suburb of Abbey-Foregate, and the Welsh Bridge (1795) to the suburb of Frankwell; while on the neck of the peninsula rises the dismantled castle, with its 11th c. gateway and a keep erected by Edward I. The winding streets, high spires, and stately timber houses with peaked gables and overhanging storeys—among them the Council House (1501–1620), where Charles I. resided in 1642 and James II. in 1687, the Ireland Mansion, and the Raven Hotel, in which Farquhar wrote his *Recruiting Officer* (1704)—make S. one of the most picturesque of English towns. There are ten churches, the Abbey Church of Holy Cross (founded by Roger de Montgomery, 1083; restored 1864), St. Mary's (restored 1865) with a spire of 220 feet, St. Alkmund's (rebuilt 1795) with the original spire (184 feet), St. Chad's (1788) with a tower of 150 feet, St. Michael's (enlarged 1873), All Saints' (1877), &c.; while the finest non-established places of worship are the Roman Catholic church, designed by Pugin (1856), and a Congregational chapel (1864) with a spire of 115 feet. Other buildings are the Shire Hall (1836); Public Rooms (1849); the new Market Hall (1868), in Italian style, 313 feet long by 150 wide, with a tower of 151 feet; the quaint Old Market House (1596); an Italian-Gothic Working-Men's Hall (1863); the Salop Infirmary (1830), with 151 inmates in 1871; and at Bicton's Heath, the Lunatic Asylum (1845), with 600 inmates in 1878. The grammar-school, founded by Edward VI., ranks high among Public Schools (q. v.), and in March 1878 had 9 masters and 164 boys. S.W. of the town the finely-planted Quarry Promenade, a public recreation-ground of 20 acres, extends along the river for 540 yards; and the monuments of S. include a Doric column to Lord Hill (1816), 133½ feet high, a bronze statue of Clive by Baron Marochetti (1860), and the Clement drinking fountain (1874). The manufacture of farm implements, thread, yarn, and 'S. cakes,' form, with brewing, malting, and glass-painting, the principal industries. S. returns two members to Parliament, and publishes three weekly newspapers, of which *Eddowes's Journal* was founded in 1794. Pop. (1871) 23,406. The Cymric *Pengwern*, S. on the expulsion of the king of Powys by Offa of Mercia (757–95) changed its name to *Scrobbesbyryg* ('the town in the scrub'). The castle, built by Roger de Montgomery,

alone bridled the rising along the Welsh border (1068), and down to the overthrow of Glendower (q. v.) in the 15th c., S. played a foremost place in the frontier wars, being captured by the two Llewelyns in 1215 and 1264, and the place where David, the last native Prince of Wales, was executed (1283). Richard II. held a parliament here (1397–98), and in the Great Rebellion S. was taken by the Parliamentarians (1644). See Phillips and Hulbert's *History of S.* (2 vols. 1837).

Shrike (perhaps from its cry), a general name applied to the members of a family (*Laniidæ*) of *Insessorial* birds belonging to the *Dentirostral* group of the order. Ornithologists distinguish between the ordinary or True S. and the Bush S. The genus *Lanius* to which the common S. belongs, is distinguished by the broad base of the bill, which is hooked at its tip. The nostrils are surrounded by bristles, the fourth quill is the longest, and the tail is graduated. The Red Backed S. (*L. colluris*) is a common species, attaining a length of from 6 to 7 inches, of a grey colour on the head, neck, and shoulders, the back being red and the under parts grey. The food consists of insects, and the male is said to impale his prey on hedge-thorns to save his mate the trouble of looking for prey on her own account, hence its name of 'butcher bird.' The Great Grey S. (*L. excubitor*) is found in Britain in winter, and attains a length of from 4 to 10 inches. The upper colour is grey, white persisting below; while the tail feathers are black with white tips. The Woodchat S. (*L.* or *Euneoctomus rufus*) is a rare British bird, but is common on the Continent and in N. and S. Africa. Its length is about 6 inches; its upper parts are of a dusky brownish hue, the head and neck being chestnut red, and the under parts white. The Bush S. form the sub-family *Thaumophilinæ*, in which the bill is long and its keel arched, its tip being hooked. The tail is long. The *T. Vigorsii* or Vigor's Bush S. is a common S. American species, attaining a length of from 12 to 13 inches. The upper parts are blackish, and the under parts greyish-brown. A crest of red feathers with black tips is found in the males, the crests of the females being black.

Shrimp (lit. 'a small fish'), a genus of *Decapodous* crustaceans allied to the lobsters and crayfishes, and forming the type of a special family (*Crangonidæ*). The members are distinguished by having the first pair of legs thickened, the second pair being slender and two-clawed, while the body is depressed. *C. vulgaris* is the common S. of sandy coasts. Other species are the *C. fasciatus*, or Banded S.; *C. spinosus*: *C. sculptus*, or Bell's S.; *C. bispinosus*, &c. Shrimps are captured in nets which are pushed through the sand before the 'shrimpers.' The Prawn (q. v.) is distinguished from the S. by the fact that the *rostrum* or beak of the shell in the former is serrated and larger than in the S. The name S. is applied to crustaceans belonging to orders more or less widely removed from that to which the common S. belongs—*e.g.*, the Brine S. (q. v.), the Fairy S. (q. v.), the Glass S., and Locust S.

Shrop'shire, or **Sal'op**, a border county of England, bounded N. by Chester, E. by Stafford, S. by Worcester and Hereford, and W. by North Wales. Area, 841,167 acres; pop. (1871) 248,111. The Severn, running S.E., divides S. into two almost equal portions. The northern, belonging to the New Red Sandstone system, is generally level, with the exception of the isolated Wrekin (1320 feet); the southern, of older formations, is mountainous, in the Clee Hills attaining an elevation of 1805 feet. In 1876 there were 168,085 acres under corn crops, 64,003 under green crops, 79,038 in clover, sainfoin, and grasses in rotation, 375,225 in permanent pasture, and 39,699 in woods. There were also 29,794 horses, 138,759 cattle, 481,871 sheep, and 58,141 pigs. S., including as it does the Coalbrookdale, Oswestry, and Bewdley districts, is an important mining centre. The yield of pig-iron in 1876 was 106,711 tons, of lead 5955 tons, of silver 2748 oz., of zinc 491 tons, and of coal 1,054,049 tons. The manufacture of iron employed (1871) 3612 persons, of engines 678, of nails 95, of earthenware 472, of thread 301, of carpets 127, and of woollen cloth 51. The county returns four members to Parliament, and contains four Parliamentary boroughs—Shrewsbury (the capital), Bridgenorth, Ludlow, and Wenlock.

Shrouds (Old Eng. *scrúd*), the great ropes supporting a mast from the sides of a ship.

Shrove'tide, lit. 'confession time' (from the verb 'to shrive;' Old Eng. *scrifan*; prob. con. with Lat. *scribere*, 'to write'), also **Shrove Tuesday**, is the Tuesday before Ash Wednesday (q. v.), or first day of Lent (q. v.), and is so called because the Catholic Church enjoined on the faithful on that day to confess their sins in order to qualify them the better for the observance of Lent. Formerly S. was a time of extraordinary sport and feasting, because licence was granted to those who had been shriven, to indulge in relaxation between that time and the beginning of Lent, before entering on the austerities of that season. Traces of the feasting and amusements of the time, which was not always confined to the Tuesday, have been preserved in the names Collop Monday and Pancake Tuesday, and lingered (till recently) in different parts of England and Scotland in the privilege claimed by school-boys on that day of 'barring out' the master, and then spending the day playing at foot-ball and cock-fighting. See Brand's *Popular Antiquities* (new ed. Lond. 1876).

Shrub (Ar. *shurb*, 'drinking,' from the same root as *sherbet*), a kind of cold punch, composed of rum or brandy and water, flavoured with lemon-juice and sweetened with sugar.

Shrubs (from Old Eng. *scrob*, prov. Dan. *scrub*, 'bush') are plants of which the perennial portion forms the greater part; that, in distinction to trees, branch near the base; and do not much exceed a man's height. To such plants, the terms *frutescent* or *fruticose* are often applied in botanical works. *Under-shrubs*, *suffruticose* or *suffrutescent* plants, comprise those in which the flowering branches, forming a considerable portion of the plant, die down after flowering, but leave a more or less prominent perennial or woody base.

Shugshut' (Turk. *Sügüd*), a small town of Asiatic Turkey, vilayet of Brussa, near the left bank of the Sakaria, 100 miles S.E. of Scutari. In a neighbouring cypress grove is the tomb of Othman, the founder of the Ottoman power. Pop. 1000.

Shum'la, or **Shu'ma**, a fortified town of the principality of Bulgaria, on the Little Balkan, to the N. of the main range, at an elevation of 800 feet, 50 miles W. of Varna, and 60 S.E. of Rustchuk by rail. It is of great strategical importance, commanding as it does the roads from the fortresses in the Lower Danube and in the Dobrudscha, and those from the eastern passes of the Balkans. It is closed in on the N. and W. by mountains, and looks out to the E. and S. on an open plain, where grain and the vine are cultivated, and where there is extensive silk culture. Surrounded by high massive walls, it is further defended by a citadel on the heights, and by several forts. An intrenched camp in the vicinity can accommodate some 60,000 men. S. has forty mosques, large barracks for cavalry and artillery as well as infantry, an arsenal, military hospital, &c. There are manufactures of copper and tin wares, silk, leather, and wearing apparel. The great S. fair is held in June. Pop. 20,000, mostly Turks. The Russians failed to take S. in 1774, 1810, and 1828. No attempt on it was made in the war of 1877–78, but the place was evacuated by the Turks on the conclusion of peace.

Shunt Rifling, a system of rifling (see RIFLED ARMS) invented by Sir William Armstrong, and adopted for the first heavy rifled ordnance of the British service, but since abandoned. Its peculiarity lies in the grooves having a deep and a shallow side, and narrowing some distance down the bore. In loading the 'shunt gun' the studs of the projectile press against the deep side of the groove, but in coming out the projectile is shunted on to the shallow side, and it leaves the gun with its axis perfectly stable.

Shusha, a fortified town of Asiatic Russia, in Transcaucasia, government of Baku, 40 miles from the Persian frontier, on an almost inaccessible chalk height, which rises 3453 feet above the sea and is washed by the Kargar-Tschai, an affluent of the Kur. It experiences great extremes of climate, and produces fruit and silk. Pop. 20,297.

Shus'ter, the capital of the province of Khuzistan, Persia, on the river Karun, 170 miles S.W. of Ispahan. It has a dilapidated wall of unburnt bricks, and is divided into twelve quarters (*mahallas*). The houses are built of stone, some being five storeys high, and the inhabitants, to shelter themselves from the heat, have excavations (*sardabs*), some of which are 60 feet deep. The district produces abundant grain and fruits. Pop. 8000.

Shut'tle (Old Eng. *sceathel*, from *scebtan*, 'to shoot'); in weaving, a boat-shaped implement of boxwood, carrying a bobbin surrounded by weft yarn, which is 'shot' by mechanical means along the S.-race through the shed of the warp. The ordinary loom S. is figured under LOOM.

Sial'ogogues are medicines which, by local stimulating action, increase the flow of saliva and of the buccal mucus. Some of them, dissolved in the saliva, exert a direct stimulant influence on the mucous membrane of the mouth, the fauces, and the epiglottis, while others, by exciting the flow of saliva, lessen the congestion of the part. Cubebs, either in the form of capsules or made into lozenges, is useful in relaxation of the fauces, of the uvula, of the upper portion of the larynx, and in hoarseness from relaxation following over-use or slight inflammation in the case of public speakers.

Siam' (Malay, *sâyâm*, 'brown'), the name applied by Europeans to the Indo-Chinese kingdom of Muang Thai ('realm of the free,' *i.e.*, free from Brahmanism), which, lying in lat. 6°-20° N. and long. 98°-106° E., is bounded N. by Burmah, E. by Anam, S. by the Gulf of Siam and the independent states at the extremity of the Malay Peninsula, W. by the Indian Ocean and the Tennasserim provinces. Estimated area, 188,000 sq. miles, or, including the semi-independent Lâos and Cambodjan provinces, 309,000 sq. miles; pop., according to the French consul (1873) 4,650,000, or with the 1,100,000 tributaries, 5,750,000. Offsets of the Himalayas extend along the western and eastern frontiers, attaining an occasional elevation of 5000 feet, and inclosing the great central plain of the Meinam, which is traversed by a third but lower and less continuous range. Of numerous streams, only three can rank as rivers—the Saluen in the W. and Meikong in the E., between them the Meinam ('mother of waters'), which, rising amid the snow-clad Yunan Mountains, divides S. into two unequal portions, and enters the Gulf of S. by three different channels after a course of nearly 900 miles, 45 only of which are navigable for sea-going vessels. To the annual inundations of these rivers in the wet season (June-August) the great fertility of the soil is due. Though barely one-third of the entire area is under cultivation, rich crops are gathered of rice, sugar, teel-seed, pepper, cotton, tobacco, vegetables, and spices, besides durians, mangoes, pineapples, and other fruits; and the remaining two-thirds are largely covered by valuable forests of teak, ebony, dye-woods, bamboo, banyans, and palm trees. These forests are denizened by the common elephant, the sacred white or rather salmon-coloured elephant, the striped tiger, rhinoceros, buffalo, python, cobra di capello, and countless birds of the most gorgeous plumage; the rivers contain huge water-snakes and crocodiles; and flying-fish, sardines, and molluscs are taken along the coasts. Tin abounds throughout the Malay Peninsula, and in the N. are found gold, copper, lead, iron, zinc, antimony, sulphur, and precious stones, but the mining industries of S. are still almost totally undeveloped. Salt and saltpetre are manufactured by evaporation.

Trade.—Commerce is almost wholly in the hands of the Chinese, and is restricted to the port of Bangkok (q. v.), which in 1876 was entered by 621 vessels (182 British) of 224,911 tons, with cargoes of £147,293 value, and cleared by 625 of 225,366 tons, the value of whose cargoes was £173,243. The exports in that year included 41,990,462 cwts. of rice, 24,270 cwts. of pepper, 20,542 cwts. of sesamum, 4207 cwts. of cardamum, 1819 tons of sapan wood, and 5360 tons of hides. How extremely the trade fluctuates may be seen by comparing the exports to and imports from the United Kingdom in 1876 and 1877. The value of exports in 1876 was £127,110, in 1877, £23,947 (sugar £23,140, and dyewoods £147); that of imports in 1876 was £5902, in 1877, £25,444 (coal £2578, machinery £9881, iron £1234, and copper £234). As a rule, Hong-Kong and Singapore engross at least three-fourths of the entire exports, Europe and America receiving barely one-tenth. For instance, in 1875, the latest year for which full returns have been published, the total exports, amounting to £1,755,711, were divided thus:—Hong-Kong, £704,540; Singapore, £569,295; China, £57,229; Europe and America, £140,576, &c. Of the imports, amounting to £1,329,841, Singapore alone furnished £836,197, the chief items being *chowls*, opium, shirtings, piece-goods, firearms, and treasure. The mercantile navy of S. consists of 2 steamers and 58 sailing vessels, with a total tonnage of 22,713 tons, besides a large number of smaller craft.

Ethnology, Religion, and Education.—The inhabitants of S. are divided by M. Garnier, the French consul, into 1,800,000 Siamese, 1,500,000 Chinese, 1,000,000 Lâos, 200,000 Malays, 50,000 Cambodjans, 50,000 Peguans, and 50,000 Karenians, &c. The Siamese themselves are generally of a medium height, with reddish-brown complexion, high cheek-bones, retreating chin, and scanty beard, standing ethnologically between the natives of China and Burmah. Their faults of indolence, vanity, cowardice, and superstition are partly redeemed by temperance, liberality, and politeness. The Siamese language forms with the Ahom, Lâos, Khanti, and Shan dialects the Taic class of the southern division of the Turanian family, but is so copiously intermixed with Sanskrit and Pali elements (5000 out of 12,000 words) as to have been erroneously regarded as an Aryan tongue. Buddhism is the state religion, but toleration is extended to both Mohammedans and Christians. The famous Phra Bat ('mountain of the sacred footstep of Buddha'), in the interior of the country, is yearly visited by crowds of pilgrims. According to the German consul, S. had in 1876 over 10,000 monasteries (*vats*), where instruction is given in reading and writing, sometimes also in Pali, arithmetic, and astrology, to boys between five and sixteen years of age. An English school for members of the royal family was established in 1862, and many of the young nobility have been educated in Europe.

Constitution, Army and Navy, Revenue, &c.—Theoretically a duarchy, the government is practically monarchical, the authority of the second king, who is chosen from the royal family by a council of twelve, being wholly dependent on that of the first. The latter exercises a mild despotism, and has the right of nominating his successor, subject to the approval of the council. He has a small standing army officered by Europeans, and all natives of twenty-one years of age are bound to serve for four months yearly in the militia. S. has two corvettes and six gunboats, with a total armament of 34 guns, and several gunboats are now (1878) in course of construction. The revenue is estimated at £8,000,000, an immense share of which, however, is embezzled by the officials, whose pay is nominal, and who are largely in excess of what is required either for the maintenance of order or the purposes of administration. Writing in 1876, the British consul states that the 'country is overtaxed, nearly all the producers' profits being taken from them by government, while no part of the taxes is spent for the people's benefit or the encouragement of trade.' For administrative purposes S. is divided into forty-nine provinces, each ruled by a *p'haya* or governor, and the chief towns after the residence Bangkok are the former capital Ayuthia (pop. 30,000), Meklong (12,000), and Chieng-Mai (15,000).

History.—The annals of S., covering the reigns of forty rulers, go back to the founding of Ayuthia in 1350 A.D., but the country first became known to Europeans through a Siamese embassy sent to the Portuguese viceroy, Alfonso d'Albuquerque, at Goa (1511). S. was subject to Pegu (1568-90) and Burmah (1758-68), but, having regained its independence under Pitak, has gradually extended its frontiers by the annexation of the Cambodjan territory (1809), the Lâos districts (1829), and the Malayan principalities (1831). Commercial treaties were concluded with England (1855), with France and the United States (1856); the first printing press was established (1862); and slavery was abolished (1872) by the present king, Somdetch Chowfa Chullalonkorn, who succeeded to the throne in 1868. See Sir John Bowring's *S.* (2 vols. 1857), and J. Bradley's *Narrative of Travel and Sport in Burmah, S., and the Malay Peninsula* (Lond. 1876).

Siam', Gulf of, a southern arm of the Chinese Sea, lies between Upper Siam and the Peninsula of Malacca. It penetrates inland from Cape Cambodja to Bankok, a distance of 450 miles, and its greatest breadth is about 240 miles.

Si'amese Twins. See MONSTER and MONSTROSITY.

Sibb'ald, Sir Robert, was a younger son of David S., third brother of Sir James S. of Rankeillour, and a scion of the Sibbald family of Balgonie, Fife. He was born at Edinburgh, 15th April 1641, educated at the High School, and studied medicine at Edinburgh University, and subsequently at Leyden, Paris, and Angers. He settled in Edinburgh as a physician in 1662, and continued his scientific studies. Together with Sir Andrew Balfour, he established a botanical garden at Edinburgh,

and was one of those who founded the Royal College of Physicians in Edinburgh. In 1682 he was knighted by the Duke of York, then High Commissioner in Scotland, and in the same year was appointed geographer-royal for Scotland. He died about the year 1712. S. published *Scotia Illustrata, sive Prodomus Historiæ Naturalis* (1689), *The History, Ancient and Modern, of the Sheriffdoms of Fife and Kinross* (Edin. 1710; new ed. Cupar, 1803), besides numerous pamphlets and treatises on medicine, botany, zoology, and antiquities. His essays contributed to the Royal Society chiefly on subjects connected with Scottish antiquities were published (1739) under the title, *A Collection of Treatises Concerning Scotland, as it was of Old and also in Later Times.*

Sibe'ria, the chief part of Asiatic Russia, occupies the whole of N. Asia, from the Ural Mountains to the Seas of Okhotsk and Kamtchatka, and from the Arctic Ocean on the N. to Corea, China, Russian Central Asia, and European Russia. The furthest N. point of S. is Tchelyuskin, or North-East Cape, the most E. Tchokotsnoi, or East Cape, on Behring Strait, the S.-most Yasyung on the Korean border, the W.-most Toll-pos-is, in the Ural, 5540 feet high. (For the inlets, islands, &c., see RUSSIA). S. is divided into the following governments :—

Governments.	Area in sq. miles.	Population.
Tobolsk	531,963	1,086,848 (1870)
Tomsk	329,026	838,756 ,,
Yeniseisk	992,838	396,783 (1873)
Irkutsk	309,180	358,629 ,,
Transbaikalia	240,774	447,563 ,,
Yakutsk	1,517,075	236,067 ,,
Amur Territory	173,554	25,204 ,,
Coast Territory	729,998	50,512 ,,
Total	4,834,408	3,440,362

Physical Aspect, Products, &c.—Except towards the Altai Mountains, and their north-eastern continuations in the Yablonoi and Stanovoi ranges which shut off the seaboard of Okhotsk and Behring Strait, S. is as low and level as Russia in Europe. Most of the seaboard thus excluded to the N.E. is highly mountainous; for instance, the peninsula of Kamtchatka is traversed by a range containing fourteen volcanoes, one of them (Kliutschevskaia) 16,152 feet high. Owing to the very gradual rise of the land from the Arctic Ocean, about one foot per mile, the great rivers Obi (q. v.), Yenisei (q. v.), and Lena (q. v.) are deep and slow, and steamers have accordingly been placed upon them, but they are not practically available for seagoing vessels on account of their mouths being almost constantly closed by ice. The Lena and Obi are purely Russian rivers, and the Irtish, the great affluent of the latter, with scenery equal to that of the Rhine, is also wholly within R. since the annexation of Dzungaria, which contains its lake-source, Zaisang. The Amur (q. v.) is defended by a steam-flotilla. By the tributaries of the Yenisei and Obi, and Lake Baikal, the entire distance from Tobolsk to Kiachta (8000 miles) can be accomplished by water, and although the route is circuitous it is the cheapest for goods. Lake Baikal (q. v.), the largest in S., and about half the size of Scotland, is a fresh-water mountain lake, with magnificent scenery, which can be viewed in summer from steamers, or (with some danger owing to landslips and torrents) from the encircling roads. It is the deepest lake known (12,360 feet). Other lakes are Changa (1689 sq. miles), Tchany (1253 sq. miles), Barum-Fari and Taimyr. The land of wheat extends E. as far as Tomsk, beyond which lie the Siberian forests. Along the Arctic seaboard are the *tundras*—treeless, shrubless, mossy flats, rendered habitable only by the presence of the reindeer. The heat which follows the extreme cold of a Siberian winter has a striking effect even N. of the Arctic circle, where a luxuriant vegetation bursts forth on land submerged by the spring thaw. In S. vast forests extend from the Altai Mountains to the Arctic circle, where vegetation dies down to dwarfed willows, hardy bushes, and saline plants. The Siberian cedar, 120 feet high at its best, gradually diminishes as it is traced E. along the same parallel of latitude, till beyond the Lena it is reduced to a mere bush. Magnificent grapes are grown around Tomsk, and on the Yenisei vegetation extends further N. than in Scandinavia. Wheat is cultivated chiefly in the basin of the Obi, and other crops are flax, hemp, tobacco, &c. The minerals found in S. are gold (of which the districts of Altai and Nertchinsk yield an annual average of 5940 pounds), silver, iron, copper, graphite, coal, and salt.

Climate.—The climate of the E. and N. is intensely cold during the nine months of winter, and very warm during the brief summer. The lower basin of the Lena is the coldest known region of the globe, and Yakutsk probably the coldest town on its surface. Here mercury remains frozen for two, sometimes three, months in the year, and the earth is frozen for a depth of 382 feet, while the summer thaw reaches only 3½ feet down. Mosquitoes are the great pest of S.; in spring they literally swarm, and the centre of a broad stream is the only refuge. From the results obtained by the levelling expedition under Kropotkin, Voyeikoff has concluded (1878) that the average pressure of the air is greater in East S. than anywhere else on the globe. In the district of Lake Baikal and the upper tributaries of the Amur it is about 30·63 inches, or ·3 inches higher than in any other part of Asia. East S., except in the extreme N., is mainly a great mass of valleys and plateaux, surrounded by mountains, and it is the hindrance these offer to the disturbance of the lower strata of the air that produces its characteristic calm and cold.

Roads, Railways, Fleet, &c.—S. is traversed by a great road connecting Tioumen, Ishim, Tomsk, Irkutsk, and Kiachta, and from E. to W. by a line of telegraph, continued (1869) along the Amur to join the Nikolaievsk-Vladivostok line opened in 1867. The first Siberian railway, between Perm and Ekaterinburg, was opened September 1878, and surveys are being pushed beyond the latter point for the projected line into Central Asia, which will probably start from Tioumen, the continuation of the Orenburg line in that direction being deemed impracticable on account of the inhospitable nature of the country. The Siberian fleet consisted in 1875 of nine war-steamers with 33 guns, and 18 steamers (not armour-plated)—in all 8300 tons burden. A University will be opened (July 1, 1880) at Tomsk, the official centre of West S.

Inhabitants.—Three-fifths of the pop. of S. are Russian colonists, miners, soldiers, officials, and exiles. An official report for 1875 says, '16,889 persons were banished to S. between May and October 1874. 1220 of these, criminals of the worst description, were sentenced to hard labour, and 1624 had been expelled from their communities as obnoxious, drunken, or burdensome. 1080 women and children over fifteen years of age, with 1269 younger children, voluntarily accompanied the exiles.' On January 1, 1876, there were 51,122 exiles in the province of Tobolsk. The native Asiatics are, in the W., Ostiaks, Samoyedes, Tungus, and Soyotes; in the E., Yakuts, Tungus, Yakuhirs, Tchuktchians, and Koryaks.

History.—Russia's possession of S. dates from 1587, when the Tartar khanate of Sibir (the modern Tobolsk) was incorporated with the Russian Empire by the Czar Feodor I., in consequence of the decisive defeat of Yermak, the proscribed hetman of the Cossacks, on the Irtish (October 23, 1581). The territory was gradually extended, and by 1639 Russia had annexed the greater part of what is now S. Kamtchatka was added in 1695-1730, Transbaikalia in 1851, the Amur territory between 1858 to 1869, and Sakhalin in 1875. From 1734 to 1743 the Russian Government carried on a 'Great Northern Expedition' for the purpose of finding a practicable passage from the White Sea to Kamtchatka. The greatest names of this undertaking were Prontchishteff, C. P. Lapteff, Tchelyuskin, Minin, and Sterlegoff. A century later, in 1843, Middendorff explored the country between the Yenisei and the Taimyr Gulf, and in 1844 he travelled E. to the Sea of Okhotsk. Schmidt's vain search (1860) for a mammoth skeleton in S. was rich in botanical and other scientific results. Tchekanovsky, in his journey through the N. part of Central S. in 1873, surveyed the Lower Tunguska for 1600 miles, and completed the explorations of its upper course, begun in 1850. In 1876 J. S. Polyakoff traversed the valley of the Obi to the mouth of the river, and collected much information regarding its fisheries, carried on by the Ostiaks. See his *Briefe und Berichte* (St. Petersb. 1877).

Two expeditions were in 1877 sent out by the Sixth or W. Siberian section of the Imperial Russian Geographical Society—which was opened at Omsk in the latter part of 1876, and has a yearly allowance of 2000 roubles—one, under Czersky, to investigate geologically the shores of Lake Baikal, the other, under Agapidin, to study the botany of the Balagan district of the

government of Irkutsk. A scientific staff, chiefly of engineers, left St. Petersburg on the 4th March 1878, under Baron Aminoff, to explore the watershed between the Obi and the Yenisei, for the ultimate object of constructing new canals. An Imperial Commission will be employed during 1879 in preparing a comprehensive work on the geographical, ethnographical, and commercial development of S., from its first conquest by the Russians to the present time. The most important fact in recent Siberian history is the establishment of sea communication between the White Sea and the Obi Estuary. Carlsen and Palliser, captains of Norwegian fishing vessels, in 1869 crossed in a few days the ill-reputed Karian Sea to the Obi Gulf, which Malygin and Shuratoff had taken two whole years to reach in 1736–37. The Swedish Professor Nordenskiöld (q. v.) made the same voyage in a sailing vessel in 1875, and in 1876 sailed in a steamer from Tromsö to the Yenisei and back between 25th July and 18th September 1876. Nordenskjöld has repeatedly made the passage since, and is now on a N.E. Passage Expedition which left Norway on the 25th July, and reached the Lena 27th August 1878. The first cargo from S. by sea consisted of 370 tons of wheat shipped at the mouth of the Obi, to which it had been brought in river boats from Tomsk, 700 miles up the river. It reached Hammerfest on the 7th September 1878, after a five weeks' voyage. See Captain B. W. Bax, R.N., *Russian Tartary, Eastern S.* (Lond. 1876), and the works of Middendorff (1859, *et seq.*), Radde (1862–64), and Etzel (1864).

Sibsaugor (*Sibsagar*, 'lake of the god Siva'), the chief town of the district of the same name, in Assam, British India, about 11 miles S. of the left bank of the Brahmaputra, 46 miles S.E. of Luckimpur. Pop. (1872) 5278. In the neighbourhood are many tanks and temples of the old native kings.—The *district* of S., which lies between the river and the Naga Hills, has an area of 2413 sq. miles; pop. (1872) 296,589. The tea-plant grows here indigenously, but the tea-manufacture did not flourish till 1852. In 1874 there were 22,573 acres under cultivation, yielding nearly five million lbs. of tea, or more than half the entire yield of the Assam valley; there were 92 Europeans and 24,000 natives employed, of whom the majority are imported from Chota Nagpur. An acre of adult plant ought to produce an average of 400 lbs., worth £40 in the English market. In 1876–77 the exports by river-steamer were 5,771,000 lbs. of tea, 64,000 lbs. of tea-seed, and 41,000 lbs. of caoutchouc. The imports included £44,000 of cotton cloth, £18,000 of grain, £13,000 of liquors, and £12,000 of salt.

Sib'yl (Gr. *Sibulla*, from *Dios Boulē*; Doric, *Sios Bolla*, the 'Counsel of Zeus') is the name by which certain prophetic women were designated in ancient times. Their number is variously stated. Ælian (*Var. Hist.* xvii. 35) mentions four—the Erythræan, the Samian, the Egyptian, and the Sardian; but it was popularly believed that there were ten in all. Of these the most famous is the Cumæan, known by the names of Herophile, Demo, Phemonoë, Deiphobe, and Amalthæa. She was consulted by Æneas before his descent into the lower world, and accompanied him in his journey through the land of Shadows. It was she who appeared before King Tarquin, offering him nine books for sale. The king refused to buy them, whereupon she went away, burnt three, and then returned, asking the original price for the remaining six. On his still refusing to purchase them she again left, destroyed other three, and on her return offered to let him have the remaining three at the price which she had asked for the nine. Tarquin, astonished at such singular conduct, bought the books; and the S. vanished. On inspection, they were found to contain directions as to the worship of the gods and the policy of the Romans. They were kept with great care in a stone chest in an underground chamber of the temple of Jupiter Capitolinus, at first by two commissioners (*duumviri sacrorum*), afterwards by a college of ten (*decemviri*), finally increased by Sulla to fifteen (*quindecemviri*). These oracle-keepers alone consulted them, by special order of the senate, in the case of prodigies, dangers, and calamities.

In 83 B.C. the temple of Jupiter was burnt, and the original Sibylline books destroyed. Ambassadors were accordingly sent to the different towns of Italy, Greece, and Asia Minor, to make a fresh collection. This was deposited in the temple when rebuilt. Spurious Sibylline books now began to accumulate and circulate in Rome. Augustus, fearing danger to the state from the abuse of them, ordered that all such should be delivered up to the prætor urbanus and burnt. Over 2000 were thus destroyed. Those that were accounted genuine were deposited in the temple of Apollo on the Palatine. The writing of these having become faded, Augustus commanded them to be re-written. The Sibylline books were carefully examined at the instance of Tiberius, and many were rejected as spurious. In the conflagration of Rome in the reign of Nero they were all again destroyed. New collections were made, which were publicly and finally burnt by the Christian Emperor Honorius. The Sibylline oracles to which Christian Fathers refer are in no sense whatever to be confounded with the older pagan collections. They are 'pious frauds,' belonging to early ecclesiastical literature, and are a curious mixture of Jewish and Christian material, with here and there, probably, a snatch from the older pagan source. The labours of MM. Alexandre and Ewald have conclusively shown that their composition ranges from the 2d c. B.C. to the 6th or 7th c. A.D., the earlier poems being Jewish and Messianic, and the later ones distinctively Christian. An exhaustive collection of these Sibylline oracles was published by Gallæus (Amst. 1689). Fragments have since been edited by Angelo Mai (Milan, 1817) and Struve (Königsb. 1818). See Bleek, *Ueber die Entstehung und Zusammensetzung der uns in acht Büchern erhaltenen Sammlung Sibyllinischer Orakel* in Schleiermacher's *Theologische Zeitschrift* (Berl. 1819), and Ewald's *Abhandlung über Entstehung, Inhalt und Werth der Sibyllischen Bücher* (1858).

Sicili, a town of Sicily, province of Syracuse, on a rocky hill overlooking a small stream, 3 miles from the coast and 8 S. of Ragusa. It occupies the site of the ancient Syracusan colony of *Casmenæ* (founded in 644), and has considerable trade, and a pop. (1875) of 10,887.

Sicilia'na, or **Sicilia'no** (Ital.), in music, a simple pastoral melody in $\frac{6}{8}$th or $\frac{12}{8}$th time, taking its name from a slow Sicilian dance.

Sicil'ian Ves'pers (Ital. *Vespro Siciliano*), the name given to a massacre of the French at Palermo on Easter Monday (March 30), 1282. The government of Charles of Anjou (1266–85), who on the fall of Manfred had mastered the kingdom of the Two Sicilies, aroused a general discontent throughout the island, and led to a conspiracy, headed by the aged Ghibelline nobleman, Giovanni da Procida, for placing Pedro of Aragon on the throne. An insult offered by a French soldier to a Sicilian bride hastened the revolt; at the vesper hour the bell of San Giovanni degli Eremiti rung the Palermo burghers to arms, and in a few hours' time 8000 French, men, women, and children, who could not pronounce the shibboleth *ciceri*, were put to the sword. Ere the end of April Messina and the other Sicilian towns followed the example of Palermo; but only after twenty years of warfare did Charles's namesake and successor formally abdicate in favour of the Aragonese dynasty. See Amari, *La Guerra del Vespro Siciliano* (2 vols. Pal. 1842; 8th ed. 1859; Eng. trans. by the Earl of Ellesmere, 1850).

Si'cily, the largest of the Mediterranean islands, is severed from Italy by the Strait of Messina, 2 miles wide, while Capo Boeo, its most westerly point, is 368 miles N.E. of Cape Bon in Africa. In shape it resembles an irregular triangle, with its apex to the W., the northern side being 200, the eastern 135, and the south-eastern 177 miles long. Area (as corrected by Petermann, 1878) 9822 sq. miles; pop. (1877) 2,736,545.

Physical Aspect, Soil, Products, &c.—S. is extremely mountainous. From the Faro di Messina in the N.E. angle, extend two ranges of Primitive formation, one southwards to Taormina, with Dinnamari (3707 feet) for its highest peak; the other westward to Milazzo, whence as far as Monte S. Giuliano (2464 feet) there runs a line of hills of Secondary formation, culminating in Monte S. Calogero (4347 feet). The rest of the island belongs almost wholly to the Tertiary formation, which, however, near Monte Laura (3231 feet) alternates with volcanic rocks, which were probably once lava streams from submarine volcanoes. Etna (q. v.), the loftiest point (10,840 feet), is a subsequent upheaval. The contrast between the heart of the island and the maritime zone extending from Palermo to Messina is striking; the former a treeless, houseless solitude, the latter a smiling champaign, rich in groves of lemon, orange, almond, and Indian fig. Navigable rivers there are none, only mountain torrents that run dry in summer; and the drought, caused by

the felling of primeval forests, is poorly compensated by a rude system of irrigation transmitted to the islanders by their Saracen predecessors. Agriculture generally is in a backward state, the rotation of crops is extremely simple, farm implements are of the rudest, and guano and artificial manure things unknown. Yet the deep loam, kept from exhaustion by the mineral substance washed down from the hills by winter rains, is of great fertility; and the hard bearded wheat, which gained for S. the title of 'Rome's granary,' retains its ancient fame, being much in request for the manufacture of macaroni.

Commerce, Industries, Roads, Railways, &c.—About one-half of the land under cultivation is in grain, one-eighth more in rice, linseed, and pulse; and the value of cereals exported in 1871 amounted to £260,000. Other exports in that year were 1,770,000 boxes of oranges and lemons, 7500 tons of dried fruits (nuts, raisins, and currants, almonds, walnuts, &c.), cotton to the value of £90,390 (its culture, extended during the American Civil War, has since declined), 3038 cwts. of manna (grown mainly in the province of Palermo), 15,800 tons of olive oil, and 22,550 tons of sumach; while in 1874, 26,495 pipes of wine, of £266,339 value, were shipped abroad, chiefly from Marsala (q. v.). Since 1858, disease has played sad havoc with the silkworms, and in 1875 the yield through S. and Calabria was only 485,100 lbs. of cocoons, and 176,400 lbs. of raw silk. Mineral products are confined to marble, sulphur, and salt (both rock and sea), the export of sulphur amounting (1874) to 191,740 tons, and that of salt being valued (1871) at £9900, a falling-off of £12,350 from the preceding year. Tunnies, anchovies, sardines, and sturgeon are caught along the coast, and the value of preserved fish exported (1871) exceeded £35,000. The trade of the island, which a century ago was almost exclusively in English hands, now passes chiefly through Swiss and German merchants. In 1871 the total exports amounted to £4,060,987; the imports (coal, iron, copper, timber, cottons, &c.) to £2,554,614; and 17,353 vessels, of 2,547,812 tons, entered the eleven ports. The roads of S. are singularly bad, 102 out of its 360 communes being inaccessible (1876) to wheeled conveyances; and three disconnected railways, with a total length (1878) of 258 miles, at present lose themselves in the interior. It is hoped, however, that the loop Palermo-Girgenti line may soon be opened, and another from Licata to S. Caterina is in course of construction.

Education, Condition of the People, Literature, &c.—Education is certainly improving. In 1862, according to official statistics, 86 per cent. of males and 95 of females could neither read nor write; in 1869 there were 944 public and 265 private elementary schools, attended by 25,073 boys and 12,454 girls, besides 74 institutions for secondary and higher education; and in 1875 the universities of Palermo, Messina, and Catania had 163 professors and 625 students. But the moral state of S. remains unchanged. Each commune has still its *mafia*, or organisation of crime, which, embracing all classes of society, controls elections, the administration of funds, the very hire of workmen; has *bravi* and bandits in its pay; and, sheltered by the *omertà* (a code of honour forbidding appeal to law), defies the Italian Government. And 'in the interior,' says Signor Franchetti, 'brigandage is the only constituted authority.' The peasants, huddled together in towns, and drained of two-thirds of their earnings by the *gabellotti* or middle-men of the great proprietors, look on the robber chieftains as champions of their wrongs. In 1876, 17,042 persons were tried—7481 for crimes (662 murders, 666 murderous assaults, 31 abductions, &c.), and 9561 for misdemeanours. Of these 13 were sentenced to death, 61 to penal servitude for life, 290 to penal servitude for shorter terms; but 6217 prosecutions were abandoned for want of proof to convict, and the total number who escaped unpunished was 10,490.—The *Sicilian dialect* contains a large proportion of foreign elements, Greek, Hebrew, Arabic, French, and Spanish. A grammar of it is prefixed to Pitrè's valuable collection of 400 *Fiabe, Novelle, e Racconti popolari Siciliani* (4 vols. Pal. 1875); and it is further illustrated in Vigo's *Conti popolari Siciliani* (2 vols. Catania, 1871-74), which furnishes specimens of the muse of Pietro Fulloni (died 1670), whom Meli places with Virgil, Dante, and Petrarch on Parnassus' heights, as also of Stefano la Sala, the blacksmith 'Ariosto of the Rustics.'

History.—When S. first looms through the mist of ages, we find its older races, the Iberian Sicani and Latini Siculi, hemmed in by Phœnician and Hellenic colonies. Already the strife of eighteen hundred years between Semite and Aryan was begun; gradually the Phœnicians were withdrawing to the north-western coast, leaving behind them traces of their presence in names like Pachynus ('station'), Catana ('little'), and Ætna ('furnace'). In 735 B.C. Chalcidians founded Naxos, Corinthians Syracuse in 734, and ere two centuries were over the Greeks had fourteen flourishing towns along the eastern and southern shores of Trinacria, as their early navigators named the 'three-cornered' isle. The Canaanite was still in the land, and Carthage, allied to him by blood and interests, came to his aid; but Hamilcar, called in by the exiled despot of Himera, was totally routed (480) by Gelon of Syracuse and Theron of Acragas. A golden age of thirty years set in, when Pindar sang the Olympic triumphs of Hiero, when Doric temples arose nobler than those of Greece, and S. boasted three millions of inhabitants. The strife of Dorians and Ionians for the hegemony, reaching to S., led Athens to undertake its fatal Syracusan expedition (415-13), which left the Dorian islanders so weakened by their victory that Carthage renewed its assaults, and soon had mastered the northern coast as far as Mylæ, the southern to Camarina. Syracuse alone checked further progress, under Dionysius (406), Timoleon (344), Agathocles, who carried the war into Africa (312), and Pyrrhus, king of Epirus (278); till finally the contest ended in the establishment of Rome's supremacy (246-10). From the time when S. became the first Roman province it steadily declined, scourged by the Servile Wars of 135 and 103, and plundered by governors of whom Verres (73-70) stands as the deathless type. Under Sextus Pompeius (46-32 B.C.) it seemed for the moment likely to rise to a separate maritime power; under the Emperors we hear of it only as the scene of a third Servile War (259 A.D.). Attached to the Eastern Empire in 395, it was conquered by the Vandal followers of Genseric (440), and by Theodoric's Ostrogoths (480), whose expulsion by Belisarius in 535 restored the island to Byzantine sway. But in the 9th c. the ancient struggle of Semite and Aryan began anew; the Saracens, landing in 827, took Mazzara (830) and Syracuse (878), and from the Sicilian coasts ravaged the realm of the Greek emperors. Two hundred years they had held their ground, and their memory still survives in monuments of Saracenic architecture and in 300 Arabic local names, when the new Norman power stepped in to wrest the prize from Greek and Saracen alike, as Rome had done twelve centuries before. After a war of thirty years, Roger (q. v.) de Hauteville, brother of Robert Guiscard, subdued the entire island (1090); his namesake and successor united the Norman conquests under his sceptre; and from his coronation (1130) as 'King of the Two Sicilies' the history of S. becomes closely identified with that of Naples (q. v.). The Sicilian Vespers (q. v.) in 1282 made S. an independent kingdom under the House of Arragon, to be again united with Naples by Alfonso V. (1442) and Ferdinand II. (1505). Since then they remained united, but for the brief period of the Savoyard government (1713-20), and of Ferdinand IV.'s expulsion from the mainland (1806-15), down to October 1860, when by the exploits of Garibaldi (q. v.) S. was incorporated with the kingdom of Italy. See L. Franchetti, *La Sicilia nel* 1876 (2 vols. Flor. 1876); G. di Blasi, *Storia del Regno di Sicilia* (3 vols. Pal. 1844); and P. San Filippo, *Compendio di Storia di Sicilia* (7th ed. Pal. 1859).

Sick'ingen, Franz von, a famous German knight, was born 2d March 1481, at the Eberburg, near Münster-am-Stein. His father, of an old knightly family of the Palatinate, had made himself a power on the Rhine, and from his mother he inherited Landstuhl and Hohenburg. After years spent in the maintenance of private feuds, S. was in March 1515 outlawed by Maximilian for warring against the city of Worms, but in spite of this he appeared before the town with 6000 foot and 1100 horsemen, among them Götz von Berlichingen. While the struggle lasted, he fought first against, then for, the Duke of Lothringen, aided François, King of France, and Ulrich, Duke of Würtemberg (1516), and in 1518 was reconciled to Kaiser Max, who freed S. from the ban to gain his service. After the Emperor's death, François and Karl both solicited his help to obtain the imperial dignity. He attached himself to Karl, who lent him 20,000 gulden 'without pledge or surety.' Ulrich von Hutten, who lived with S. at Ebernburg, gained him over to the reforming principles, and persuaded him to support Reuchlin (q. v.) against the Dominicans of Köln, and take Butzer, Œcolampadius, and Schwebel into his service. In 1521 and 1522 S. fought for Karl V. in the

Ardennes at the head of an army of mercenaries. Systematically secularising the church lands on the Rhine, 'to make way for the new learning,' he was gradually nearing his great aim, a principality for himself, when in the autumn of 1522, during his feud with Trier, Philipp of Hessen and Ludwig of the Palatinate advanced against him, and on the 10th October he was outlawed by King Ferdinand. Shut up and besieged in Landstuhl, he was on the 1st May 1523 mortally wounded, and died on the day after the capitulation, 7th May 1523. His children regaining the castle twenty years after, erected a stone monument over his grave in the chapel there, which has been restored by the present owners. Maximilian raised the S. family to the rank of 'Reichsfreiherren,' Joseph III. to 'Reichsgrafen.' The line of S.-Hohenburg is still flourishing. See Ulmann, *Frans von S.* (Leip. 1872).

Sickle. See REAPING.

Si'cyon, the capital of Sicyonia, a state of ancient Greece, 2 miles S. of the Corinthian Gulf, and 10 miles N.W. of Corinth, part of the site of which is occupied by the modern village of *Vasilika*. The city was built upon a flat hill defended on every side by precipitous rocks, and washed E. by the Asopus, and W. by the Helisson. It was one of the oldest cities of Greece, and is spoken of by Homer as the abode of Adrastus. At first dependent upon Argos, it afterwards was closely allied to Sparta, and aided her in the Megarian and Peloponnesian wars. It joined the other Greeks in the Lamian War (368 B.C.), was captured by Demetrius Poliorcetes (303), after whom it was subject to various tyrants until freed by Aratus (251). By the influence of the latter it became one of the most important cities in the Achæan League, but it was afterwards ravaged by Cleomenes (233), and by the Ætolans (221). S. was the earliest school of statuary in Greece, and gave its name to one of the great schools of painting, which was founded by Eupompus, and to which belonged Pamphilus and Apelles, both natives of S. Its art treasures were removed to Rome in the ædileship of M. Scaurus.

Si'da, an extensive genus of *Malvaceæ*, consisting of herbs or shrubs of very various habit and character, usually covered with a soft tomentum. They are spread through the tropical and subtropical countries of the world, but are most abundant in America. The characteristic mucilaginous and fibre-yielding properties of the order are represented in the genus. Several species enter into Indian materia medica, the root of *S. acuta* being used as a bitter tonic and as a remedy for snake-bites, its leaves and those of *S. retusa*, *S. stipulata*, and *S. mauritiana* as poultices, other species for rheumatic affections, &c. *S. tiliæfolia* is cultivated in China for its fibre.

Siddhártha, 'he who has accomplished his aim,' the name said to have been given at birth to Gautama Buddha. This was his individual name, Gautama that of his family, and Buddha ('enlightened') a subsequent appellation. See BUDDHISM.

Sidd'ons, Sarah, England's greatest tragic actress, was the eldest daughter of Roger Kemble, manager of a provincial company, and was born at Brecon, in S. Wales, 5th July 1755. She was already an actress of some experience, when in 1773 she married a Mr. S., a member of her father's company, with whom she removed to Cheltenham, where her acting attracted attention and procured her an introduction to Garrick. As 'Portia' she made her *début* at Drury Lane, 29th December 1775, but failing during the season to produce any great impression, she was not re-engaged in the summer following. Her self-confidence, however, was unshaken, and the ensuing six years, spent in the provinces, chiefly at Birmingham and Bath, brought her splendid powers to maturity. On the 10th October 1782, she again appeared at Drury Lane, and this time her triumph was complete. She continued to play at Drury Lane, adding to her fame in every new part, till the difficulty of obtaining her salary from Sheridan, that 'drowning gulf,' drove her to Covent Garden in 1803. Here she played till she bade farewell to the stage, 29th June 1812. Subsequently she appeared only on behalf of a charity or a 'benefit;' but she continued to give wonderful public readings—at Oxford and Cambridge, by special invitation of the universities—till within a year or two of her death, which took place in London, 8th June 1831. Her majestic beauty is preserved in Reynolds' famous portrait of her as the 'Tragic Muse.' The vast audiences she enthralled carried their admiration to the pitch of rapture, and in later times, critics, uninfluenced by the 'S. fever,' write of her as the peerless queen of the English stage. Her power in tragedy was of the widest range, compassing the grandest transports of passion and the tenderest subtleties of pathos. Among her more famous parts were Lady Macbeth, Queen Catherine, Isabella in *Measure for Measure*, Constance in *King John*, Desdemona, Hermione in *Winter's Tale*, Jane Shore, Elvira in *Pizzaro*, and Millwood in *George Barnwell*. The minute, intelligent study she bestowed on Shakespeare, is proved by her Memoranda. In her greatest triumphs, such as *Macbeth* and *Measure for Measure*, she was associated with her brother, John Kemble (q. v.). Mrs. S. imparted new dignity to her profession, no less by her spotless reputation than by her genius. Esteemed by George III. and his queen, she numbered among her friends Johnson, Reynolds, Burke, Fox, &c. See the *Lives* by Boaden and Thomas Campbell (Lond. 1834); also Lewis' *Actors and Acting* (Lond. 1875).

Side'real Day is the interval of time between two successive meridian passages of the same star, and the sidereal year is the interval between the sun's being in the same position amongst the stars. A sidereal clock is a clock which indicates sidereal time, and is an indispensable instrument in an observatory.

Sideroxy'lon is a genus of about sixty species of erect trees or shrubs belonging to the natural order *Sapotaceæ* spread round the world within the tropics, and reaching also New Zealand, Madeira, and the Cape. The fruit of *S. dulcificum* being exceedingly sweet is used as food to counteract the acidity of other food or drink. The timber of some species is so heavy as to have acquired the name of iron-wood—hence S. Gr. *sidēros*, 'iron,' and *xylon*, 'wood.'

Sidi-Bel-Abbés, a fortified town of Western Algeria, 50 miles S. of Oran, with which it is connected by a railway opened in 1877. It is the centre of the chief district in Algeria for producing the alfa or esparto grass (*Macrochloa tenacissima*). Pop. (1872) 8787.

Sid'laws (the 'South Laws' or 'Hills;' *i.e.*, south of the Grampians), a range in Scotland extending from Kinnoull Hill, near Perth, N.E. through Forfarshire to Brechin. The highest point is Kingseat (1255 feet), the most interesting Dunsinnan (1114 feet), the *Dunsinane* of Shakespeare. The chief formation is Old Red Sandstone, alternating with shale and conglomerate, and resting on porphyry and greenstone.

Sid'mouth, a watering-place of S. Devon, 20¾ miles E.S.E. of Exeter by rail, lies in a valley between the sandstone cliffs of High Peak (513 feet) and Salcombe Hill (497 feet). The church of St. Giles (rebuilt 1860) contains a stained W. window erected by the Queen in memory of her father, who died here (1820), and there are assembly, ball, and reading rooms, public baths, and a fine promenade 1½ miles long. S. publishes one weekly newspaper. Pop. (1871) 3360, considerably increased since the opening of the railway in 1874.

Sid'mouth, Henry Addington, Viscount, the son of a London physician, was born at Reading, May 30, 1757, and passed from Winchester School to Brasenose College, Oxford (1774). He graduated B.A. (1778), and entering Lincoln's Inn was called to the bar (1784), a week later being returned to Parliament for Devizes. A firm supporter of Pitt, he filled the office of Speaker from 1789 to 1801, when differences having arisen on the question of Catholic Emancipation, Addington, as one of the 'King's Friends,' was called on to form a ministry, the chief event of which was the short-lived Peace of Amiens (1802). Pitt's return to power on condition of his abandonment of Emancipation (1804) was accepted by Addington, who for six months held the presidency of the council (1805), being at the same time raised to the peerage as Viscount S. As Secretary of State for the Home Department (1812-22) he incurred considerable obloquy by his conduct at the Manchester Reform meeting (1819); and having in 1824 withdrawn from official life, died at his residence in Richmond Park, February 15, 1844. Fearless and conscientious S. certainly was, but withal 'as dull and bigoted as George III. himself' (Green). See his *Life* by Dean Pellew (3 vols. 1847).

Sidney, Algernon. See SYDNEY.

Sid'ney, Sir Philip, born at Penshurst, Kent, November 29, 1554, was the eldest child of Sir Henry S., who during his son's college days was lord-deputy of Ireland. From Oxford Philip retired without a degree in his seventeenth year, and after a brief season of idleness, probably spent at court, he accompanied the Earl of Lincoln on an embassy to Paris in 1572. While there he witnessed the Massacre of St. Bartholomew. After travelling in Germany, Hungary, and Italy, he returned to England in 1575, in time to join the Court at Kenilworth. At the age of twenty-two he was sent by Elizabeth to congratulate Rudolf II. on his accession to the imperial dignity, and on his return he wrote a masque called *The Lady of May* (1578), to amuse the Queen at Leicester. Favourite as he was, he dared the Queen's frown by presenting to her a 'remonstrance' on her contemplated marriage with the Duc d'Anjou, and they say that his 'remonstrance' had great weight with its recipient. However, he was soon after this called to account for quarrelling with Oxford, and retired from court. While living with his sister, the Countess of Pembroke, he composed *The Countess of Pembroke's Arcadia* (1580–81), a romance in prose and verse. It is a medley after an Italian fashion then popular, its verse too full of conceits to read like poetry, and the rest too poetical to read like prose. It is full of noble imagination, decked out in laboured rhetoric; in form it grafts the heroic upon the pastoral. Its author wished to destroy it a short time before his death, but the Countess of Pembroke rescued it, and published it in 1590. It passed rapidly through many editions. Waller and Cowley treasured it highly, and it was the solace of Charles I. in prison. To the same period belongs a metrical version of the Psalms of David executed by S. in conjunction with his sister, and *The Defence of Poesy*, first published in 1595 as *An Apologie for Poetrie*. It is written in terse, simple language, with dignity defends letters from the attack of such as Gosson, and forms the first piece of serious literary criticism in our language. S. was knighted by Elizabeth in 1583, and in the same year married Frances, daughter of his friend Sir Francis Walsingham. His love, however, had been centred on another, Penelope Devereux, daughter of the Earl of Essex, who married Lord Rich. His suit to this lady, expressed partly in words of unaffected passion, partly in the chivalrous flattery then forming the current coin of courtiers, is contained in the sonnets entitled *Astrophel and Stella* (1591). As in the case of Shakespeare, editors have made these sonnets to bear a complete history of their writer, tracing his love through its innocent dawn, its guilty noon, to the serene evening of purified and sacrificed love. This theory in S.'s case is plausible. History or not, *Astrophel and Stella* contains rich poetry, sometimes worthy of Spenser at his best. The Queen had now grown so fond of Sir Philip that she prevented his accompanying Drake on an American expedition, and even, it is said, disappointed him of the Polish throne. He was made Governor of Flushing in 1585, and in the latter part of that year served as general of horse under his uncle, the Earl of Leicester. Leicester was as ignorant of military tactics as his nephew was skilful, and Sir Philip gained scope for his generalship, but at Zutphen, on September 22, 1586, he received a Spanish ball in the left thigh, and, after great agony, died on the 7th of October. He was buried in St. Paul's Cathedral, and a public mourning was decreed him. Panegyrics, English, French, Latin, Greek, Hebrew, were written upon him by the score; of these Spenser's elegies are the best known. The figure of S. is the one in Elizabeth's court upon which the eye rests most delightedly. He was the favourite of his Queen, the patron and friend of Spenser, the contemporary of Shakespeare, a polished courtier, an accomplished scholar, a spirited general, a subtle poet, a true, tender-hearted gentleman, the idol of his age. He is described best in words he used regarding another, 'high thoughts seated in a heart of courtesy.' His *Miscellaneous Works* were published by Gray (Oxford 1829). The latest and most complete collection of S.'s Poems is that by the Rev. A. B. Grosart (3 vols. Lond. 1877). See *Lives* by Fulke Greville (1652), Zouch (1808), Lloyd (1862), and H. R. Fox-Bourne (1862).

Sidney Sussex College, Cambridge, founded in 1598 by the Lady Frances Sidney, Countess-Dowager of Sussex, consists of a master, ten fellows, and twelve foundation-scholars, three of whom receive £60 and nine £40 per annum. There are also six senior Taylor scholarships of £60, and ten junior of £40, three Blundell scholarships for Tiverton school of £60, and ten other scholarships and exhibitions of from £50 to £12. S. S. presents to eight livings, and in 1878 had 47 undergraduates, 98 members of the Senate, and 198 members on the boards.

Si'don, or **Zi'don** (Heb. 'fishery'), one of the cities of ancient Phœnicia, on the coast of the Mediterranean. It lay on the southern side of a small promontory. The history of S. down to the 13th c. is given under Phœnicia (q. v.). Although the city was almost completely destroyed during the troubles of the 13th c., in the middle of the 15th c. it reappeared, under its modern name of *Saida*, as the port of Damascus, and under Fakhr-ed-Din, Emir of the Druses (1594–1634), a period of prosperity was begun, during which it regained not a little of its former splendour. It became again the great emporium on the Syrian coast of the trade between the East and West, and its population at one time rose to about 20,000. S. suffered severely in the wars between the Druses and the Turks in the 18th c., and after Jezzar Pasha expelled the French consul (1790) and merchants, it again lost all its trade. The ruin of the city was completed in 1837 by an earthquake, which partly destroyed it. The population was estimated in 1876 by the British consul to be about 10,000, and it still has a small trade in exporting tobacco, fruits, olive oil, and grain. In 1876 there entered and cleared 79 vessels of 40,944 tons, the imports amounting to £15,454, the exports to £23,922. See Bädeker's *Syrien und Palestina* (1876).

Sie'bengebirge, an interesting group of trachyte and basalt peaks situated on the right bank of the Rhine, about 20 miles above Köln. The seven highest peaks, from which the name is derived, are Oelberg (1522), Löwenburg (1505), Lohrberg (1444), Nonnenstromberg (1105), Petersberg (1096), Wolkenburg (1076), and Drachenfels (1066 feet). From the Drachenfels which is the nearest of all to the river, a beautiful picturesque view is obtained.

Sie'bold, the name of a gifted family of physicians, anatomists, and physiologists in Germany, of whom the most distinguished was **Philipp Franz Balthasar von S.**, born February 17, 1796, at Würzburg, where he studied medicine and the natural sciences. Entering the service of Holland, he accompanied the troops to Batavia in Java as medical officer in 1822. In 1823 he was commissioned by the government to visit Japan in the interest of science. S. spent six years in studying the flora and fauna of the Japanese islands, returning to Europe in 1830 to complete the publication of his results. In 1859 he again visited Japan, and returned to Europe in 1862. He died at Munich, October 18, 1866. S.'s chief works are *Epitome Linguæ Japonicæ* (1826, 2d ed. 1853), *Fauna Japonica* (6 vols. 1832-41), *Niphon, Archiv zur Beschreibung von Japan* (20 vols. 1832–57), *Bibliotheca Japonica* (6 parts, 1833–41), *Flora Japonica* (1835-53), *Isagoge in Bibliothecam Japonicam* (1841), *Catalogus Librorum Japonicorum* (1845), and *Urkundliche Darstellung der Bestrebungen Niederlands und Russlands zur Eröffnung Japans* (1854).

Sied'lec, the chief town of a Russian government of the same name, kingdom of Poland, 40 miles E. by S. of Warsaw. The seat of a Roman Catholic bishop, it has a fine palace, girt with beautiful gardens, and carries on important baking, distilling, and sugar-refining industries. Pop. (1872) 10.013. The *government*, lying between the Vistula and the Bug, nearly corresponds to the old palatinate of Polachia. Area, 5534 sq. miles; pop. (1872) 548,970. In 1872 it yielded 1,430,369 chetwerts of potatoes, and the produce of its 359 factories (607 distilleries, 400 sugar-refineries, 339 glass-works), employing 1951 men, was 1,921,160 roubles.

Siege (Fr. *siège*, 'a sitting down,' from Lat. *sedeo*, 'I sit'), the prosecution of offensive works against a fortified position with a view to its reduction. The Romans perfected the methods used by the Greeks in such operations, and their great sieges, such as Carthage, Jerusalem, &c., were models in regard to the skilful employment of every possible military resource of the time. They constructed with great rapidity strong intrenched lines in front of the point of attack, faced by a covered gallery from which various galleries were run forward for the conveyance of material to fill up the ditch. Square wooden towers with rams and drawbridges supported the attack. A breach was made by the ram or mine, or the works were

captured by escalade. In modern warfare the operations of a siege depend on the character of the works and the number and gallantry of its defenders. Recent improvements in weapons of offence and the means of defence have greatly altered the conditions of a campaign, and where so much depends on particular circumstances, it is impossible to lay down any hard and fast rules for the reduction of strong places. There are several broad leading methods pursued, however, such as an assault prepared by the system of parallels, a vigorous bombardment, or an effectual blockade. In the S. of a single fortress, and often of more important places, the method of parallels, invented by Vauban, has been steadily followed by military commanders for nearly two centuries. The point of attack having been decided upon, a strong position is taken up beyond the reach of the enemy's artillery, and a road is gradually cleared to the fortress. When the ground has been gained for its construction, the first parallel is begun during the night. It consists of a trench 3 feet below the ground, while the earth thrown up forms a mass 3 feet above the level, thus giving ample shelter to troops. It extends along the entire front to be attacked, and if it does not terminate in a natural obstacle such as a river, should have protecting redoubts at either end. The batteries of the second artillery position are next established, and, after they have silenced the fire of the fortress, zig-zag roads are constructed to the site of the second parallel. A similar course is followed till the total number of parallels, from three to seven, according to circumstances, are completed. The approaches are then pushed on by sapping till the glacis is neared and the passage of the ditch accomplished, when the fortress is ready for storming. A S. of this kind is attended with comparatively small loss of life, and is effectual in the long run, but requires at least several weeks for its operations. The S. of Sebastopol lasted eleven months, during which 50 miles of trenches were constructed. In the S. of Strassburg in 1870, the Germans took 51 days to complete their approaches, upon which the garrison surrendered. The number of men required for a S. by this method in proportion to the garrison varies according to the strength of the latter. Sir John Jones is of opinion that the besieging army should be five to one to the besieged when the garrison is 15,000, eight to one when the garrison is 3000, and in still greater proportion when the garrison is smaller. During the recent Franco-Prussian and Russo-Turkish wars many fortresses capitulated after a few days' or weeks' bombardment.

In the case of a city or an intrenched camp occupied by a large army, the operations are either made on the foregoing plan or are confined to a thorough blockade until the stores of the besieged are exhausted. Fighting in the latter case is usually confined to a struggle for the communications of the place, bombardments, and encounters with sorties. Where the possibility exists of the approach of a relieving army, lines of defence, called lines of circumvallation, should be thrown up by the besiegers to protect their rear, and a vigilant watch kept up by a reserve portion of the army. Such was the simple plan followed at Metz, Paris, and latterly at Plevna. A strong intrenched line of outposts was established all round the fortifications, behind which lay the main line of the army, while to the rear central points were selected and strongly fortified. The line of investment at Metz was 24 miles, and at Paris 45 miles. In the case of Metz the besiegers numbered 200,000, while the beleaguered army amounted to 173,000. After the investment has been completed, the advantage even in armies of equal numbers appears to be on the side of the besiegers, as they can accomplish their purpose without leaving their works, while the besieged are compelled to throw themselves sooner or later against the intrenchments. In these days of breechloaders, the open assault of even slight intrenchments well defended is almost impracticable. Nothing in modern warfare could equal the folly of the attempts by the Russians to carry Plevna by assault when their losses were so appalling, except, perhaps, the foolhardy attacks by the Turks on the Russian positions in the Shipka Pass.

Siege Artill'ery, large ordnance too heavy for field purposes, used in the operations of a siege. A *siege train* of 105 pieces consists of

55 rifled 64 pounders, } on travelling carriages
20 ,, 40 ,, } with siege limbers.
and 30 ,, 8-inch howitzers, on travelling carriages.

Sieg'en, a town in the S. of Westfalen, Prussia, on the left bank of the Sieg, 63 miles E. of Köln by rail. Situated in the richest iron district in Germany, it has extensive iron works, manufactures of paper, leather, soap, and hosiery, besides woollen and cotton-weaving, bleaching, dyeing, and printing. S. is possibly the birthplace of Rubens (q. v.). Pop. (1875) 12,902.

Sie'mens, Ernst Werner, a celebrated electrician, was born at Lenthe, near Hanover, December 13, 1816. In 1838 he became an officer in the Prussian artillery; but devoted most of his time to scientific studies. In 1841 he patented a method for electroplating and gilding; and in 1848, in Schleswig-Holstein, he laid the first submarine mines which were fired by electricity. The next year he retired from the army, and, along with Halske, founded a telegraphic establishment at Berlin, which has constructed the telegraph lines of Russia, Spain, Brazil, N. Germany, &c. By his numerous improvements and inventions he has rendered great services to telegraphy; and has, besides, made valuable researches in electrical science generally.—His brother, **Karl Wilhelm S.**, was born at Lenthe, April 4, 1822, and studied at Göttingen. In 1843 he settled in London as a civil engineer, and in 1853 founded a branch of the Berlin house, at the same time erecting a large establishment at Woolwich for the construction of telegraphic apparatus. He became a member of the Royal Society in 1862, was president of the Institution of Mechanical Engineers, and was first president of the lately-constituted Society of Telegraph Engineers. He also presided at the Iron and Steel Congress which met for the first time at Paris in the summer of 1877. He is the inventor of a regenerating gas furnace, a bathometer, a pyrometer, &c. His pyrometer measures high temperatures by the change of electrical resistance in a given bar of metal due to heat. His publications relate chiefly to these inventions, and are valuable contributions to the literature of science. The most important are *On a Regenerative Condenser* (1850), *On the Conversion of Heat into Mechanical Effect* (1853), *On a Regenerative Steam-Engine* (1856), and *On the Increase of Electrical Resistance in Conductors*, &c. (1871).—**Friedrich S.**, a third brother, was born December 8, 1826, at Menzendorf. He began life as a seaman, but in 1846 followed his brother Karl to London, and greatly aided him in perfecting his gas furnace. Of late years he has conducted a large establishment for the manufacture of glass at Dresden.—**Walter S.**, a fourth brother, has established himself in Tiflis, and conducts large copper and cobalt works.

Sie'na, a city of Central Italy and capital of a province of the same name, picturesquely situated on three hills, 58½ miles S. of Florence by rail. It is still surrounded by an ancient wall about 4 miles in circumference, with seven towers and nine gates, and has in its N.W. quarter a citadel, the Forte S. Barbera, built by Cosmo I. in 1560, which is connected by the Lizza promenade (laid out in 1779), with the Via Cavour, one of the principal streets. In the centre is the semicircular Piazza del Campo, now called Vittorio Emanuele, the largest square, from which eleven streets radiate in irregular lines. It contains the Palazzo del Governo (1469-1500), since 1859 the repository of one of the largest collections of archives in Italy, with 52,000 parchment charters; and the Palazzo Pubblico (1289-1309), with fine paintings by Sodoma and others of the Sienese school. Adjoining the latter is the tower Del Mangia, 295 feet high, and opposite is the marble Fonte Gaza, with bas-reliefs of Scriptural subjects by Jacopo della Quercia (1419). The noblest edifice of S. is the Duomo or Chiesa Metropolitana, which is one of the finest specimens of Italian Gothic architecture. It is 291 feet long and 80 feet wide, while the transept is 165 feet long. Its façade is of red, black, and white marble, and its pavement is covered with 'Graffito' representations in marble. The Duomo contains many works of art by Michael Angelo, Pinturicchio, Duccio, and other masters. Other interesting buildings are the churches of S. Maria della Scala (13th c.), and S. Domenico (1220-1465); the Biblioteca Comunale, said to be the most ancient in Europe, containing 40,000 vols. and 5000 MSS.; the Instituto delle Belle Arti, with a rich collection of pictures, principally of the older Sienese school; and the house, now converted into an oratory, in which St. Catharine of S. was born in 1337. The university was founded in 1349, and had in 1874-75 28 professors and 113 students. S. has important manufactures

of woollens, silks, paper, beet-sugar, and alcohol. Pop. (1877) 21,887. S. was made a *colonia* under Augustus, with the name *Sena Julia*. It became a free city at the beginning of the 12th cent., and joined the Ghibelline party. Long the powerful rival of Florence, it inflicted upon that republic a severe defeat at Monte Aperto in 1260. Intestine strife, however, gradually sapped the strength of S., and the supremacy fell into the hands of various tyrants, last of whom was Pandolfo Petrucci, surnamed *Il Magnifico*, by whose influence it became subject to the Medici of Florence, and was finally joined to Tuscany in 1557.

Sienna Earth. See BURNT SIENNA.

Sierr'a, the name given in Spain and Spanish colonies to mountain ranges. The Portuguese form is *serra*. The word is commonly derived from Lat. *serra*, 'a saw;' but is more probably the Arabic *sehrah* (the same as 'Sahara'), 'a desert place.'

Sierr'a Leo'ne ('lion mountain'), a British colony on the W. coast of Africa, situated between 7° 20′ - 8° 40′ N. lat. and 12° 20′-13° 20′ W. long. It consists chiefly of a peninsula, 25 miles by 12, and a number of islands, the total area of the colony being 468 sq. miles. A narrow strip of low and fertile land borders the coast, but the bulk of the country consists of rugged granite mountains, which reach a height of 3000 feet. The rainfall is excessive, amounting to 144 inches annually, and combines with the heat to render the climate so deadly to Europeans that S. L. has earned the evil designation of 'the white man's grave.' Though indigo grows wild, and much of the country is also well adapted to the growth of sugar and coffee, none of these crops is cultivated. The chief exports are palm-oil, ground-nuts, caoutchouc, gum, ginger, and ivory; and the imports consist principally of cottons, wearing apparel, arms and ammunition, and hardware. In 1875 there entered 491 vessels of 143,181 tons, and cleared 465 of 141,282 tons; the imports amounting to £326,011, the exports to £350,202, of which but £25,248 were produce of S. L. itself. The first British settlement was made in 1787, when a number of negro refugees were brought to S. L. by a company which disposed of its interest in the place to the British Government in 1809, though S. L. was not duly accredited as a colony till 1822. The population was chiefly recruited by the slaves captured by British cruisers after the abolition of the slave-trade in 1807, and has declined since the cessation of this supply. In 1871 it amounted to 37,089, of whom only 107 were whites. The capital, Freetown, contains about half the population of the colony. It has a good harbour. The government is administered by a governor appointed by the Crown, and assisted by executive and legislative councils, and forms with the Gambia (q. v.) the 'Government of the West African Settlements,' in which the Gold Coast (q. v.) and Lagos (q. v.) were also included from 1866 to 1874. S. L. is also the see of a bishop.

Sierr'a Ma'dre, a branch of the Mexican Cordilleras, extending in a N.W. direction to the borders of the United States. Here there is a long break in the chain; but another range of mountains in New Mexico retains the name. The S. M. is very rich in silver deposits, but as yet has been imperfectly explored.

Sierr'a More'na (Lat. *Montes Mariani*), a chain of mountains in Southern Spain, separating the tablelands of New Castile from the plains of Andalusia. It is about 220 miles long, and from 15 to 50 miles wide, and runs as a rule nearly due E. and W., though tending slightly to the N. It forms the watershed between the Guadiana on the N. and the Guadalquiver on the S. Some of the peaks rise to a height of about 5200 feet, but most of them reach only a little over 3000 feet.

Sierr'a Neva'da, so called from the perpetual snow with which some of the peaks are crowned, a bold and picturesque mountain range in the province of Granada, Southern Spain, about 60 miles long and from 20 to 25 miles wide, running almost due E. and W. The peak of Mulhacen (11,372 feet high) is the loftiest mountain in Europe W. of the Alps, while the Picacho de Veleta (11,000 feet) has the most southern glacier. The S. M. is celebrated for the picturesque abruptness and boldness of its form.

Sierr'a Neva'da. See ROCKY MOUNTAINS.

Sieyès, l'Abbé Emmanuel-Joseph, Comte, born at Fréjus, 3d May 1748, was educated by the Jesuits of his native town, the Doctrinaires of Draguignan, and lastly in the seminary of St. Sulpice. He took the priesthood, and was attached in 1775 as canon to the Bishop of Tréguier, following him (1780) to his new diocese of Chartres, of which he became the vicar-general. Shrinking within his shell, the 'light, thin, passionless man' lived wholly for his studies—languages, metaphysics, mathematics, political economy, only not history. 'To judge the present by the past,' he would remark, 'is to deduce the known from the unknown.' Three pamphlets by him broke the lull that followed the dissolution of the Assembly of Notables, of which the last, *Qu'est-ce-que le Tiers État* (1789) had a great effect. 'There is then one man in France,' said Mirabeau, and wrote to the author, 'My master, for such you are;' while Madame de Staël observed, 'The writings and opinions of the Abbé will form an era in polity, as Newton's in physics.' One of the twenty Paris deputies to the States General, he solved the question raised by the schism between the Orders and the Third Estate, by his suggestion to the latter's representatives of the title 'National Assembly;' and in the Convention voted the execution of the king, with or without—historians differ—the famous formula: 'Death, and no words about it.' He had, indeed, his phrase for each turn of revolution, as when, after cowering through the Terror, he reappeared with 'I have lived;' or on the fall of the Directory exclaimed, 'I must get me a sword.' Napoleon's colleague in the Consulate (1799) with Ducos, he quietly went on building constitutions, till, sick of shadows, he dropped them for the realities of a pension, estate, title, decoration, and seat in the Senate. S. was one of the earliest members of the Institute, from which, however, his banishment as regicide at the Restoration excluded him (1815), nor was he re-admitted till his return from exile (1830). He died in Paris, 20th June 1836, leaving behind him a number of published and unpublished works, all equally forgotten. Those who would understand his paper constitutions may find them discussed at length in Boulay de la Meurthe's *Théorie Constitutionelle de S.* (1836) and Beauverger's *Étude sur S.* (1851).

Sigh'ing, a respiratory act, often prompted by mental impressions of conscious or unconscious kind, and commenced by a prolonged effort of inspiration, in which the diaphragm descends. The expiratory act which follows, and which constitutes the 'sigh,' is caused by the recoil of the chest walls and lungs, and by the action of the abdominal muscles. S., in short, illustrates simple respiration as modified by mental conditions. In the 'breathless attention' of a person listening to a speaker, or witnessing some exciting scene, the respirations become very short and quickly recurring, with an occasional long 'S.' inspiration at intervals.

Sight, in gunnery, is a piece of metal attached or applied to a gun or firearm, so as to give more accurate means for directing the shot. It consists of two parts, one fixed near the muzzle, and the other near the breech; and these are brought into the same line with the object aimed at.

Sigilla'ria, one of the most abundant and striking of the trees which flourished during the deposition of the great coal strata, and the remains of which contributed very largely to the formation of coal itself. When deterioration occurs in some of the coal seams, by the presence of earthy constituents, the carbonised stems of S. may be observed, piled one above another in almost unbroken succession, so as to form a compact coaly mass, enough of the stem markings being left to render identification easy; while in the associated shale and sandstone beds impressions of it are commonly found. When in a mature, living condition, it must have presented the appearance of a tall and massive pillar-like tree, which either remained simple or forked towards its extremity; the stem being traversed longitudinally by grooves or ridges, and at regular distances between these, long narrow leaves were attached, known in a fossil state as *Cyperites*. As regards its minute internal structure, there has been proved to be a close approximation to the other genera of fossil *Lycopodiaceæ*—the natural order to which S. itself belongs. A central cellular portion or medulla was surrounded by a cylinder of barred vessels; outside this, another layer of loose, cellular tissue was succeeded by one of elongated cells or pleurenchyma.

Sig'ismund, German Emperor, born February 14, 1362, son of the Emperor Karl IV. of the house of Luxemburg,

on the death of his father (1378) inherited the markgrafdom of Brandenburg. He married Maria, daughter and heiress of Lewis the Great of Poland and Hungary, and after a hard struggle gained the crown of the latter country in 1387. Becoming involved in war with the Turks, he was decisively defeated by Bajazet I. at Nicopoli in 1392. After his return he was imprisoned by the Hungarians and deposed (1401), but at length, on the death of Ruprecht of Pfalz in 1410 chosen Emperor by some of the electors, he was universally recognised as such from the death of his rival, Jobst, Markgraf of Moravia (1411). S. was a zealous promoter of the General Gouncil of Constance (1414-18), which put an end to the 'Great Schism,' burnt Huss, and brought about the Hussite War. On the death of his brother Wenceslaus (1419) S. inherited Bohemia, but did not obtain possession of it till 1436. He sold Brandenburg in 1415 to Friedrich Hohenzollern, burg-graf of Nürnberg, the ancestor of the present German dynasty. S. died 9th December 1437, when the male line of the house of Luxemburg became extinct. See Aschbach, *Geschichte Kaiser S.'s* (4 vols. Hamb. 1838-45), Dr. L. von Bezold, *König S. und die Reichskriege gegen die Husiten* (Munich 3 vols. 1872-77).

Sig'ismund I. (*Zygmunt*), King of Poland, the youngest son of Casimir IV., was born January 1, 1467. He was elected Grand Duke of Lithuania, and succeeded his brother Alexander on the throne of Poland (1506), whose independence he had much ado to maintain against the Russians and Tartars. To his sister's son, the Grandmaster Albrecht, S. granted the hereditary Duchy of Prussia, on the 8th April 1525. The policy of his reign was tolerant to the Dissidents, and favourable to the advancement of art and science. Lutheranism penetrated into Poland in his life-time. S. died at Cracow, April 1, 1548.—His son and successor, **S. II.**, born August 1, 1520, became ruler of Lithuania in 1544, and of Poland in 1548. His reign is chiefly remarkable for the complete union of Lithuania with Poland, and for the incorporation of W. Prussia, Volhynia, Podolia, and the Ukraine at the Diet of Lublin in 1569. He guaranteed complete religious toleration at the Diet of Warsaw in 1572, and died on the 18th July of that year, the last of the Jagellons.—**S. III.**, born June 20, 1566, only son of King Johan III. of Sweden and the Polish Princess Catharine, was in 1587 elected King of Poland. In 1594 he was crowned King of Sweden, where he left as regent his uncle, Karl IX., on whose taking possession of the crown in 1604, S. made war on Sweden (q. v.). In a war against the Turks he gained the great victory of Chodkiewitz in 1621. He died April 30, 1632.

Sig'nalling, a means of communication between distant points by visible or audible signs, according to a preconcerted system. The firing of beacons to warn off the approach of an enemy, or to spread the news of the consummation of some expected event, is probably the most ancient really efficient method. With the rise of commerce and the growth of national intercourse, S. became a much more important consideration, especially at sea, where ships though within sight of each other are usually far beyond the limit at which articulate sounds can be heard. In naval S. flags are very generally employed. By combining different coloured flags in various ways a large number of distinct signals can be made. Each of these indicates a number corresponding to a word, phrase, or sentence, which is entered in a book. By furnishing these books to all vessels intercourse may readily be carried on between them. Such a system of signals is technically called a *code*. That of the British navy is capable of expressing about 14,000 words or phrases. In the merchant service the code is not so extensive, since, excepting the signals of distress, more is rarely required than is sufficient to give a ship's name, nationality, her captain's name, the port to which she is bound, &c. At night instead of flags lights are substituted. Flashing signals constructed upon the principle of the Morse telegraph alphabet, with long and short flashes may be advantageously used. This system is strongly advocated by Sir William Thomson of Glasgow, himself an experienced navigator, who further recommends the substitution of two loud notes of different pitch for the long and short flash when on account of fog the light could not be seen. On railways S. is also of extreme importance. Here, however, the code is small, and different coloured lights or flags are amply sufficient. The electric telegraph is itself a most efficient yet simple method of S., and has completely displaced the semaphore as a transmitter of intelligence across large tracts of country, besides linking together in a close bond continents thousands of miles apart. See BEACON, SEMAPHORE, TELEGRAPH. Bells, horns, bugles, guns, rockets, whistles, &c., are constantly used in S. The storm warnings now issued by the Admiralty Office in Great Britain are signalled by means of cones hoisted at various stations round the coasts. See STORMS.

Sig'nature, in music, the signs placed at the beginning of a composition, denoting the time and key. The time S., expressed by a fraction, the denominator expressing fractional parts of a semibreve, and the numerator the number of these in a bar, is only printed at the commencement of the first line, and where there is a change in time; while the key S. governing the notes requiring sharpening or flattening is placed at the beginning of every stave. When a new key in a piece of music continues only for a short time, the alterations are made by the prefixing of sharps and flats as required, but where it is lengthy a new S. contradicting the preceding is used. The signatures of relative major and minor keys are the same, and the body of a piece often requires examination to see whether it is in the major or minor mode. See MUSIC.

Sig'net. The seal for the authentication of royal grants was so called in England. But warrants under the Royal Sign Manual (q. v.) are now effective if countersigned by a Chief Secretary of State. In Scotland, there is a class of law agents called 'Writers to the S.' (q. v.), the S. having been, in that country, the seal of state affixed to royal warrants.

Sign'ing, Seal'ing, and Deliv'ery is the mode of executing a deed in English law. The signature of the party, or parties, to the deed, must be written, or owned, in presence of two witnesses. A wafer, or seal, is attached, on which the party puts his finger, and says—'I deliver this as my act and deed.'

Sign-Man'ual is the signature of the sovereign, which must be affixed to writs under the Great Seal, or the Privy Seal (see SIGNET). The S.-M. is usually only the initial of the sovereign's name, with the letter R, for *Rex* or Regina, as *V. R.*

Signorell'i, Luca, the forerunner of Michael Angelo, was born at Cortona 1441, and in his thirteenth year apprenticed to Piero della Francesca. From him he acquired that mastery of anatomy seen in his first 'Madonna' and 'School of Pan,' both which he painted for Lorenzo de' Medici soon after coming to Florence (1475). At Florence and Loreto, in the Sixtine Chapel at Rome and half the Umbrian and Tuscan churches, he painted in the next twenty years frescoes and altarpieces, the finest perhaps a 'Circumcision,' now in the Hamilton Collection. All were eclipsed by the eight spirited 'Scenes from the Life of St. Benedict' in the monastery of Monte Oliveto (1497), as these again by the 'Doom' at Orvieto (1499-1503), where, in his kinsman Vasari's words, 'angels, devils, ruins, nudes, and foreshortenings are done with a wondrous and inventive fancy.' This the most daring and learned outcome of the Renaissance, the painter's triumph and monument, brought him a second summons to the Vatican; but in 1510 he withdrew to his native city, where, working to the last, he died in 1525. See two articles by Prof. Colvin in the *Cornhill* (1875), and Fisoher's *L. S. und die Italienische Renaissance* (1878).

Sigour'ney, Mrs., an American authoress, born at Norwich, Connecticut, 1st September 1791. Her maiden name was Lydia Howard Huntley, but in 1819 she married Mr. Charles Sigourney of Hartford. Her first work was *Moral Pieces in Prose and Verse*, published in 1815, after which her literary productiveness was unceasing. She published fifty-nine volumes of tales, poems, and essays, principally on moral and religious subjects, earning by the general tone of her writings the name of 'the American Hemans.' Among her most notable works are *Letters to Young Ladies* (1833), *Pocahontas, and other Poems* (1841), *Pleasant Memories of Foreign Lands* (1842), in which she recorded her impressions of a tour in Europe in 1840, and her posthumous autobiography *Letters of Life* (1866). She died at Hartford, June 10, 1865.

Sig'urd or **Sieg'fried**, originally **Sig'ward** ('the victorious'), was the son of Siegmund the Volsung and Queen Sigelind. Brought up by the smith Mimir, he acquires prodigious strength, and fights with and slays the dragon Fafner, thus obtaining the hoard of the Niebelungen and the tarn-cap of invisibility. A

bath in the blood of the dragon gives him invulnerability, except in a spot between his shoulders, where a leaf had adhered to his skin. He next rescues Brynhild, but becomes by the influence of magic oblivious of all that had passed, presents himself at the court of Wurms, and receives in marriage Gudrun or Chriemhild as a reward for having, by means of his tarn-cap, made Brynhild the submissive bride of Gunther. Brynhild, being taunted on this account by Chriemhild, sends against the hero Hagen, who pierces S. through his vulnerable spot as he was lying on his face drinking from a fountain in the forest.

Sihun. See JAXARTES.

Sikhs (a corruption of a Sanskrit word meaning 'disciples') is the name of the great community, half religious, half military, who founded a state in the Punjaub, India, under Runjeet Singh (q. v.) at the beginning of the present century. According to the general census of 1868-72, they number 1,174,436 throughout British India, of whom more than one million are found in the Punjaub; but even in that province they only form 6 per cent. of the total population, being most numerous between the Ravi and Sutlej rivers, in the districts of Lahore, Umritsur, Umballa, and Jullundhur. Externally, they may be known by blue garments and unshaven hair. As a religious sect, the S. acknowledge Nanuk (q. v.) as their founder. He preached a doctrine of fervid monotheism, based upon a religious and moral purity, which owed something equally to Hinduism and to Islam. He was himself of the Khetri or ancient warrior caste; but the greater number of his followers were Jats or Juts (see JAT), the prevalent race in N.W. India, supposed to be of Scythic descent. From Nanuk ten *gooroos* or apostles are traced down to Govind Singh, who died in 1708, having transformed a religious sect into a community of fanatical warriors. Up to this date the S. had passed through much persecution from the Mohammedans, the memory of which is still fresh. But they saved themselves from extermination in their mountain fastnesses at the foot of the Himalayas, and retained their faith with incredible tenacity. Taking advantage of the decay of the Mogul empire, and with the example of the Mahrattas to encourage them, they gradually extended themselves down both banks of the Sutlej, forming an armed confederacy bound together partly by the principle of religious equality, and partly by that of feudal submission. The name by which they called themselves was *Khalsa*, an Arabic word, meaning 'select' or 'liberated;' their point of union was the acceptance of the *Grunth* or 'Book,' compiled by Arjun, the fourth *gooroo*: and their watchword was *Wah goorro!* or 'Hail, *O gooroo!*' The rite of initiation consisted in being sprinkled with sugar and water from a vessel which had been stirred with a dagger; and they devoted themselves to the service and contemplation of steel, as of a patron deity. During the 18th c. the S. took advantage of the continuous warfare between the Moguls, the Afghans, and the Mahrattas to strengthen their political power. Though Govind Singh left no successor, and a cruel persecution fell upon them immediately after his death, the fervour of their religious belief kept them together. In 1757 one of their chiefs was sufficiently established at Lahore to coin rupees, in the name of the *Khalsa*. They organised *misls* or recognised confederacies, and year by year all met at the sacred city of Umritsur, to hold council together and to bathe in 'the pool of immortality' dug by the third *gooroo*. But the Sikh supremacy dates from the rule of Runjeet Singh, who was appointed governor of Lahore by the Afghan emperor in 1799, and quickly enforced his recognition as the chosen leader of the *Khalsa*. Before this time the S. had been mere freebooters, who owed their impunity chiefly to the disordered state of the country. On his death in 1839, he had established an undisputed dominion from Multan to Cashmere and from the Sutlej to Peshawur. He left a revenue of two and a-half millions sterling, and an army of 50,000 men, trained by European officers, and with a full complement of guns. He died during the disastrous expedition of the English into Afghanistan, towards which he had himself unwillingly contributed. Of the sons who succeeded him the first was an imbecile, the second (the present Maharajah Dhuleep Singh) an infant of a few months. The ministers were either incapable or treacherous; and the army of the *Khalsa* would be content with nothing less than an invasion of English territory. This caused the first Sikh War of 1845-46, followed by the second Sikh War of 1848-49, after which the Punjaub was finally annexed. The Sikh army fought worthily of its reputation, and the English victories in the field were dearly purchased. The sepoy had found his match, and even European regiments were known to quail before the disciplined fanaticism of the S., who courted martyrdom. It was only the enormous resources of England, and an overwhelming weight of artillery, that finally gained the day at Gujerat. Since then, Sikh history has been merged into the general administration of the Punjaub, the greatest triumph of English character and energy which India has seen. During the Mutiny of 1857-58, not only the Sikh cultivators of the Punjaub, but also the Sikh irregular regiments, stood loyal. It was Sikh feudatory chieftains who were among the first to join the camp before Delhi; and before and after that date, Sikh soldiers have been found most useful on distant or foreign service, as having a special zest for military duties, and being destitute of any caste prejudices against crossing the seas. From being the most formidable foes, they have been converted into the strongest support of the English power. See Cunningham's *History of the S.* (Lond. 1853); Sir J. W. Kaye's *History of the Sepoy War* (Lond. 1876); Professor E. Trumpp's *Adi Granth, or the Holy Scriptures of the S.* (Lond. printed by order of the Secretary of State for India in Council, 1877).

Sikkim', a native state in the Himalayas, between Nepaul and Bhutan, in political connection with the government of Bengal. Area, about 1550 sq. miles; pop. about 7000; estimated revenue £1600, including £600 a year paid by the English and £200 by the Chinese. S. is important as containing the most direct trade-routes from India into Thibet, which have hitherto been kept closed by the jealous influence of the Chinese Government. The ruling family is Buddhist in religion, and of Thibetan descent. In 1835 the sanitarium of Darjeeling was ceded to the British, in consideration of a payment at first of £600, now of £1200, per annum. In recent years much has been done to develop the transit trade with Thibet. The Lieutenant-Governor of Bengal has had repeated interviews with the Rajah and his minister. In 1876-77 the registered imports from British India were valued at £14,000, chiefly indigo, cattle, metals, and tobacco; the exports at £80,000, including £70,000 of timber floated down the Runjeet river. The capital is at Tumlung from November to May; for the rest of the year it is removed to Chumbi, on the Thibetan side of the range. The products are rice, Indian corn, millet, oranges, tea, and cotton cloth; the minerals are lime and copper. See Dr. Hooker's *Himalayan Journals* (Lond. 1854).

Sile'ne, the type-genus of the tribe *Sileneæ*, of the natural order *Caryophyllaceæ*, consisting of annual or perennial herbs or sometimes slightly shrubby plants. There are upwards of 200 species, of which eight are British, seven of these being dispersed more or less through the N. temperate zone, and one (*S. gallica*) is now spread as a weed over all temperate regions. The genus does not contain any very showy or remarkable species, though several are in cultivation as dwarf annuals or perennials. Among such *S. acaulis*, forming bright green moss-like cushions, with an abundance of pretty pink flowers, is well adapted for rock-gardens. It is a native of most alpine rocks in N. and Central Europe and N. America, attaining in Scotland an altitude of 4300 feet. Some are night-flowering plants, and are sweetly fragrant, *e.g.*, the British *S. noctiflora* and *S. nutans*, and a large group are glandularly hairy —hence the English name of 'Catchfly.' *S. inflata* and *S. maritima* are noticeable for their inflated calyx-tube, and are generally called 'bladder-campion.'

Sile'nus, the name of the chief Satyr (q. v.) who faithfully attended Dionysus. He was son of Pan and Gaia, fought against the giants, and slew Enceladus. Besides the voluptuous inclinations which he shared with the other satyrs, S. had a far-reaching gift of prophecy.

Sile'sia. See SCHLESIEN.

Si'lex (Lat. 'flint'), a generic name given by some mineralogists to the silicates which occur in nature as minerals. Of these rock-crystal, quartz, chalcedony, and flint may be mentioned. See QUARTZ.

Silhet or **Sylhet**, the chief town of the district of the same name, now annexed to the province of Assam, British India, at the foot of the Khasi Hills, on the river Surmah, a tributary of

the Brahmaputra. It is a Mohammedan town, built on raised ground among the marshes. Pop. (1872) 16,846.—The *district* of S., transferred to Assam in 1874, though entirely disconnected from the valley of the Brahmaputra, lies S. of the Khasi and Jyntia Hills. Area, 5383 sq. miles; pop. (1872) 1,719,539, nearly half the total population of the province. It is crossed by the river Surmah, which is navigable by steamers. The chief crops are rice and oil seeds. In 1876-77 the registered exports to Bengal were valued at £597,000, chiefly tea, £285,000 (mostly from Cachar), rice £86,000, lime £79,000, oil seeds £52,000, potatoes £37,000, oranges £13,000; the imports were valued at £440,000, including piece-goods £144,000, salt £112,000, sugar £28,000, tobacco £26,000, spices £22,000. Special manufactures are the weaving of fine mats and carving in ivory, and formerly the making of shields.

Silhouette', profile portrait or representation of an object, outlined and filled in with black colour, a few white lines being sometimes introduced for effect of relief. These shadowy portraits were fashionable in France during the reign of Louis XV., and their name arose out of public ridicule for the niggardly finance of his minister, M. Etienne de Silhouette.

Sil'icate Paints. The manufacture of S. P. is extensively carried on by the Silicate Paint Company at Liverpool and London. The new industry originated a few years since on the discovery of a large deposit of almost pure silica near Llandudno, in N. Wales. This natural silica, when dried, forms an almost impalpable powder, which mixes readily with colours and oil. The S. P., which may be had of all colours, are non-poisonous, unlike the ordinary lead paints. The new silicate white has a base of sulphide of zinc, is whiter, more durable, and has a greater body and covering power than white lead; the colour is not affected by gases, and heat of 500° is successfully resisted.

Sil'icon (Si = 28), a chemical element resembling carbon in many of its properties. It occurs in nature as a constituent of *silica* (SiO_2), the best-known varieties of which are quartz, sand, and flint. For long silica was regarded as an elementary substance, and it was not till 1813 that Davy succeeded in decomposing it by the action of potassium, and thus obtaining a specimen of S. The element is obtained now more easily by decomposing silico-fluoride of potassium ($2KF,SiF_4$) with potassium or sodium at a high temperature, when the alkaline metal combines with the fluorine to form a salt soluble in water, and S. is left in the form of a brown powder. It may be obtained in two other conditions: as *graphitoid S.*, by heating amorphous S. to a high temperature out of air; and as *crystalline S.*, obtained by cooling from fusion. The amorphous form burns brilliantly in oxygen, and resists all acids except hydrofluoric. The graphitoid variety, on the other hand, refuses to burn in oxygen or dissolve in hydrofluoric acid. S. forms only one hydride (SiH_4), in this respect differing widely from carbon. This hydride takes fire spontaneously in air, evolving clouds of silica and depositing a brown film of the element upon a cold surface. Besides silica, two other oxides are believed to exist. They have been obtained, however, only as hydrates, having the compositions represented by the formulæ $3SiO,2H_2O$ and $Si_4O,2H_2O$, and are known respectively as *leucone* and *chryseone*. Silica, like carbonic acid, is a weak acid, but owing to its being non-volatile at a high temperature displaces most of the other acids from their combinations. United with bases it forms *silicates*, the chemistry of which is very complicated. The greater part of the earth's crust is composed of these silicates, which are mostly fusible, and all except the alkaline compounds insoluble in water. Hydrofluoric acid is a universal solvent; and heating with a fluoride and strong sulphuric acid has the effect of decomposing the silicate and driving off the S. as fluoride (SiF_4). This gas also results from the action of hydrofluoric acid upon silica. It is colourless, fumes strongly in air, and is decomposed by water into silica and silico-fluoric acid ($Si_2H_2F_6$), an acid liquid which attacks metals, forming a series of salts known as the silico-fluorides. Of these the alkaline salts, and especially the silico-fluoride of potassium, are soluble in cold water. See CLAY, FELSPAR, GLASS, &c., for more detailed account of the common silicates and their use in the arts.

Silis'tria, or **Silis'tra** (also *Distra*, the anc. *Dorostorus* or *Dorostena*), a fortified town of Bulgaria, 70 miles below Rustchuk, on the S. bank of the Danube, and 5 miles from the point where the easterly frontier of Bulgaria retires from the river, which is here a quarter of a mile wide, and is studded with islets. A fortress of the first rank, it is defended by walls of solid masonry and by detached forts of great strength, and forms the most advanced point of the Bulgarian quadrilateral, the other posts of which are Rustchuk, Varna, and Schumla. S. is badly built and dirty, many of the houses being mere huts, but it has twelve mosques, a Greek cathedral, and four churches, an agency of the Danube Steam Shipping Company, many public baths, large bazaars, and a house of quarantine. There are leather and cloth industries, and considerable trade in grain, timber, wine, and garden produce. Pop. 20,000, comprising Turks, Bulgarians, Greeks, and Jews. S. was the scene of a victory gained by the Byzantine emperor, John Zimiskes, over the Russians under Sviatoslav in 971. It has played an important part in the Russo-Turkish wars. Attacked in vain by Romanzov in 1773, it capitulated to Langeron in 1810, was beleaguered and taken in 1829, and on the outbreak of the Crimean War was besieged by Paskievitch, with an army of 80,000. On this occasion it was defended by Mussa Pasha and the former Prussian officer Grach, with a garrison of 15,000, and after thirty-nine days of siege and assault, during which two young English officers, Captain Butler and Lieutenant Nasmyth, displayed incomparable gallantry, the Russians retired with a loss of 12,000 men.

Sil'ius Ital'icus, a Roman poet, born about 25 A.D., rose through high distinction as a pleader at the bar to the consulship in 68, the year of Nero's death. Vitellius made him proconsul of Asia, and, after discharging this office with honour, S. retired from public life, and died at the age of seventy-five. His chief work was the *Punica*, an heroic poem in 17 books, narrating the events of the Second Punic War. The materials are drawn from Livy and Polybius, and worked up 'maiori cura quam industria' (Pliny) into the coldest and dreariest composition ever misnamed a heroic poem. This, the only extant work of S., was discovered by Poggio at St. Gall during the Council of Constance, and was first printed at Rome in 1471. The best editions are those of Cellarius (Leip. 1695), Drakenborch (Utrecht 1717), Ernesti (Leip. 1791-92), Ruperti (Gött. 1795-98), and Lemaire (1823). There is a translation into English by Ross (Lond. 1661); into French by Villebrune (Par. 1781); and into German by Bothe (Stuttg. 1856).

Silk-Cott'on is the name given to the enveloping silky fibre of the seeds of various species of *Malvaceæ*, belonging to the genus *Bombax* (Gr. *bombyx*, 'raw silk'), or the allied genera *Eriodendron* (Gr. *erion*, 'wool or down,' and *dendron*, 'tree'), *Chorisia*, and *Ochroma*. *Bombax* consists of tall trees with digitate leaves, and solitary or clustered red and white flowers on axillary or terminal flower-stalks. Their fruit is a large, woody, five-celled capsule, containing numerous seeds, each of which is surrounded with a quantity of beautiful silky hairs, designed for the ready dispersion of the seed when the capsule bursts. The genus has its headquarters in tropical America, with outliers in tropical Africa, Asia, and N. Australia. *B. Munguba*, of Brazil, &c., has the S.-C. of a light-brown colour; thus far it has not been utilised for more important purposes than stuffing cushions and similar domestic services. Of *B. Malabaricum*—a very large tree, attaining a height of 150 feet and a girth of 40 feet in S. India and Burma—the fruit is collected before it opens, and the S.-C. with which it is filled is used to stuff quilts and pillows. The calyx of the flower-bud in this species is eaten as a vegetable; a gum which exudes from the bark is used in native medicine; and the light porous wood serves for planking, canoes, floats, scabbards, &c. *E. anfractuosum*—the W. Indian cotton-tree—is a lofty tree, generally with a straight columnar stem, and of a strikingly imposing appearance; the leaves are palmate, and it produces a profusion of pale rose-coloured flowers. The 'wool' is used both in Jamaica and Africa for mattresses, &c. So also is the material obtained in Brazil from *C. speciosa*, and in Central America and the W. Indies from *O. Lagopus*.

Silk'worm and **Silk'-Culture.** Silkworm is the name given to those species of *Lepidopterous* insects which spin a silken-*cocoon* or pupa-case in their larval condition for the enclosure of the *pupa* or *chrysalis*. The silk-gland and *Spinneret* or thread-joining organ are situated on the *labium* or lower lip of the larvæ. The family *Bombycidæ* (Latreille) includes the various species of silkmoth.

The bodies are thick and heavy. The head is sunk in the thorax and is of small size. The mouth-parts are ill-developed as compared with those of other moths, and the antennæ are comb-like. The genus *Bombyx* itself includes the *B. mori*, the typical Chinese silkmoth, which has white fulcate front wings, its hind wings falling short of the tip of the abdomen, whilst the antennæ are markedly comb-like. The average length is 3 or 3½ inches. The larvæ is naked and slender, and possesses a horny process on the tail. It is cream-coloured, but the hue varies greatly. Captain Hutton, in the Proc. Entom. Society of London, has given a number of interesting particulars regarding the silkmoth larvæ. Bad food, scanty light, and bad ventilation have the effect of causing disease in the silkmoth larvæ, the effects of interbreeding also causing disease. The 'worms' of a brood which are dark grey or brindled, the *vers tigrés* or *vers zébrés* of the French, are examples of the healthy original stock of the silkworm larvæ. Captain Hutton maintains that the original colour of the worm was dark, and his experiments of selecting the dark worms of each brood and of interbreeding the dark-coloured forms, resulted in the production of a healthy race, producing better cocoons than the ordinary or pale-coloured larvæ. White cocoons, according to Hutton, are a sign of the degeneracy of the race. The silkmoth may breed twice or three times yearly in India, and the larvæ moult three or four times. About 360 cocoons of ordinary size weigh 1¼ lbs., and in France and Italy about thirty-six days elapse between the hatching of the larvæ and the manufacture of the cocoon. Four days is the usual period occupied in the formation of the cocoon. In England and in some districts in India thirty-six days may be required. The *Bombyx mori* feeds on the leaves of the mulberry, which itself was derived from the mountainous provinces of China. Hutton, however, has shown that no less than twelve species of S. worms have been confounded with the *B. mori*. At least six species of the genus *Bombyx* are domesticated. The following is a list of other genera and species of moths producing silk :—

Bombyx Pernyi of N. China; feeds on oak leaves; cocoon large, greyish brown; reeled only in China as yet.

B. Cynthia feeds on *Arlanthus glandulosa*, of China and N. Asia, produces a long greyish cocoon; not reeled in Europe.

B. Yama-Mai, a Japanese silkmoth, feeds on oak; cocoon greenish, thread strong; much valued in Japan.

Antheræa paphia of India, large, hard, dark-grey cocoon, known as the *Tussur moth*: affords 'Tussur silk' of India.

B. ricini of Bengal, feeds on castor-oil plant; produces a cocoon similar to *B. cynthia*.

Telea polyphemus is the American silkmoth. The silk is coarser than that of *B. mori*, but has a rich gloss. Larvæ feed on the oak. Moths leave cocoons late in May, eggs laid in middle of June; caterpillars hatched in ten or twelve days; larvæ moult five times; cocoon formed late in September; pupa state passed in winter. Many other species of moths have been made the subject of experiment and investigation, but the foregoing are the chief species depended on by silk-cultivators.

Silk is the strongest, most lustrous, and therefore most valuable of all textile fibres. Ordinary S. is the produce of the cocoons of the common silkworm, *Bombyx mori*; but increasing attention is now being devoted to the cocoons of various allied species of *Bombyx*, *Attacus*, &c., the most of which are enumerated under the article COCOON. Such as have come into prominent industrial notice in Europe will be hereafter alluded to, attention being first given to the common silkworm alone.

There is no doubt that the now widespread silkworm was originally a native of China, where according to native records it was reared, and S. was reeled from a period, according to our chronology, anterior to the Deluge. It certainly was there cultivated from an exceedingly remote period. From China the cultivation extended to the Corea and Japan several centuries before Christ, and in spite of the most rigorous precautions on the part of the Chinese S. culture was begun in N. India before our era. Its progress westward was slow; in 420 A.D. it was produced in Khotan, whence it travelled to other Central Asiatic regions, Bokhara, Khiva, Samarcand, &c., and in the 6th c. the industry was firmly established throughout Persia. The culture did not reach Europe till A.D. 552, when, according to Gibbon, the Emperor Justinian encouraged certain monks to revisit China, who accordingly 'deceived a jealous people by concealing the eggs of the silkworm in a hollow cane, and returned in triumph with the spoils of the E.' From Constantinople, where the worms were first reared, the cultivation spread but slowly westward, and it was the 16th c. before the industry was fairly established in France under the patronage of François I. To a limited extent only S. culture has been introduced into America, and in Australia, New Zealand, and the Cape of Good Hope considerable attention is now being devoted to the industry.

The S. industry, pursuing it no further than the production of the raw fibre, divides itself into two sections; 1st, the rearing of the cocoons, and 2d, filature or reeling of the raw S. The silkworm, like all its congeners, in its life history passes through four stages or periods of existence—the egg state, the caterpillar, the chrysalis, and the moth. A large trade exists in the eggs, called 'graine,' of the silkworm, and since the development of the disease which at one time threatened the extinction of European S. a great quantity of 'graine' has been annually brought to Europe from Japan. The eggs in a French 'manganerie' are deposited by the female moth on a piece of soft cloth or paper, to which they adhere by a gluey liquid which covers them. They are preserved in the egg state till spring, women carrying them in small parcels about their persons, and placing them under their pillows at night; and other means are taken to defend them from undue cold. The eggs are hatched at that period when food is prepared for the caterpillars by the development of the leaves of the mulberry, and in the subsequent growth of the worm five ages or periods of moulting are noted, extending altogether over about one calendar month, when the caterpillars are kept in a uniform favourable temperature. In the first age of five days the worms from 1 oz. of 'graine' eat 6 lbs. of leaves; during the next four days, the second age, they require 22 lbs.; in the third age, embracing six days, 65 lbs. of leaves are required; in the seven days of the fourth age 200 lbs. of leaves are consumed, and in the nine days of the fifth age no less than 1200 lbs. of leaves are eaten by the worms. At this point the worm 'mounts,' or ceases to feed, and takes up the position where it is to spin its cocoon. The cocoons are finished in a few days, and in order to prevent the development of the moth, and its puncturing the cocoon in order to escape from its prison, means must be taken to kill the insect at this point. This is accomplished by the application of artificial heat, an apparatus for steaming the cocoons being now in very general use. If 'graine' for the next season is desired, the best-developed cocoons are chosen, and from these the perfect moths are permitted to escape when they have reached maturity. On an average 1 oz. of 'graine' produces about 88 lbs. of cocoons. The cocoons vary in size considerably; the largest being about the size of a pigeon's egg, with a golden yellow or white colour, and generally having the appearance of a slight construction around the centre of their long diameter. A cocoon yields a continuous fibre varying in length from 750 to 1150 feet. The varieties of the ordinary silkworm in cultivation are extremely numerous. About the year 1820 there appeared in France a disease among the silkworms which subsequently became known as *Pébrine*, and which, gradually spreading, attained by the year 1855 the dimensions of a great national calamity. From France the disease extended into N. Italy, where its effects became equally disastrous, and the fatal blight travelled eastward, similarly affecting every S.-producing country, and even China itself. The disease showed itself by the eggs placed for incubation dying; such worms as were developed presented an unequal and starved appearance, and frequently died before spinning their cocoons; while such as actually propagated a new generation produced eggs and worms still more degenerate. Thus arose, primarily in France, but subsequently in other countries, the necessity of importing 'graine' from distant unaffected provinces, and by degrees the 'graine' had to be drawn from regions more and more remote, while the demand for healthy eggs increased, and the price advanced in proportion. A time actually came when Japan, the only country free from the disease, had to supply eggs to all European S.-growing countries, and in 1868 not less than 2,800,000 oz. of eggs were sent to Europe from Japan alone. The direct loss to French cultivators during thirty years preceding 1867, was calculated to be one milliard of francs, while in Italy in ten years the loss was not less than two milliards. From the *Statisque de la Production de la Soie en France et à l'Étranger*, issued by the Syndicate of the Union of Lyon S. merchants in 1877, we learn that the total production for 1876 in Europe, the Levant, and Eastern Asia, amounted to 17,946,600 lbs., or nearly a fifth less

than for 1874. There were in the United States 213 S. factories, employing 18,007 hands, and producing goods to the value of $27,158,071 in 1876.

S.-Reeling.—The fibre of S. differs from all other textile fibres in being produced in one unbroken thread of indefinite extension, whereas all others are, more or less, in short lengths. The preparation of raw S. from cocoons, therefore, differs in its processes from the other fibres in use. The operation of reeling is conducted in establishments termed 'filatures,' and the process is one of considerable simplicity. The essential apparatus consists of a reel, attached to which is a guide-rod, a series of eyelet-holes and crossing-points, and a basin for water. The basin in which the cocoons are placed is divided into a number of compartments, and there is an arrangement for heating and maintaining the water it contains at any required temperature by means of steam. Into each of the compartments, say four, a definite number of cocoons are placed, according to the size of filament to be made. The reeler switches them about briskly till all the superficial floss is removed and the ends of the true thread are obtained. These he seizes and passes through the first guide-hole, where they are twisted into a single strand. A corresponding number of similar filaments pass through a neighbouring guide, and the strands from the two are carried forward, twisted together, so as to form for a short space a thread of two strands. They again diverge, pass through separate guide-eyes, meet again to form a single strand, which, meeting another pair which has been similarly advancing, intertwist, separate again, and finally the whole four, intertwisted as one, pass over the guide-rod to the reel. By this 'croisage' or intertwisting and re-separation of the filaments, and finally twisting into one, a round smooth thread is obtained. The filament on the outer part of a cocoon is much thicker and stronger than the inner layers, and therefore, in reeling, great skill and judgment are necessary on the part of the operative to maintain the resulting thread of uniform size throughout. On this uniformity the quality and value of the raw S. greatly depends, and to maintain it the reeler from time to time varies the number of filaments which go to make up the strands and final thread. In other words, the reeler must skilfully vary from time to time the number of the cocoons from which he reels the filaments. The fineness of raw S. is determined by the weight of each skein containing 400 revolutions of the reel (400 ells), and is expressed by 'deniers,' of which there are 24 in every grain. The number of deniers is called the 'title' of the S., and it is usually quoted as an indication of quality. It is in this condition that raw S. is usually imported and sold; but before it is ready for the weaver or other use it undergoes several operations, all of which are embraced under the term

S.-Throwing.—Of the process comprehended under this term the first is winding, or transferring the raw S. from skeins to bobbins. The skein is stretched on the 'swifts,' a light revolving framework from which the S. is transferred to bobbins. The S. is next 'cleaned' by reeling it from one bobbin to another, the thread in its progress passing between two parallel plates placed so close to each other that the occurrence of any knot or husk is automatically detected, and the machine is thrown out of gear till the cause of obstruction is removed. In 'doubling,' which next follows, two threads from separate bobbins are brought side by side and wound together without any twist on a single bobbin. The amount of twist necessary to give coherence and uniformity to the thread is given in a subsequent operation, and according to the method and amount of twist given, the S. is known in commerce as 'singles,' 'tram,' or 'organzine.' Singles simply consist of the single filament of raw S., either untwisted as it is delivered by the reeler, or only sufficiently twisted to give it the necessary amount of compactness to bear the operations of boiling and dyeing through which it passes before weaving. 'Tram' consists of two or more untwisted filaments doubled, and subsequently twisted only sufficiently to make a compact thread. 'Organzine' is made up of two or more filaments first separately twisted, then doubled and retwisted in the reverse direction.

Raw S. in the natural condition, or 'in the gum,' as it is termed, presents a somewhat hard wiry appearance from the presence of gummy exudation which surrounds the filaments as they are formed by the worm. For some purposes, as, for example, in the manufacture of ordinary crape, the gum is retained in the S., but generally the raw material is cleaned, the colour discharged, and the fibre softened by a process of boiling, or 'discharging.' For this purpose the hanks of raw S. are ranged on a long stick, immersed for half an hour in boiling water which contains soap and soda carbonate, squeezed, and again steeped for several hours in a hot solution of soap. It is afterwards rinsed perfectly free from the soapy solution in cold water, and at this stage it is ready to receive any dye for which it may be intended. In the boiling, S. loses at least a fourth of its original weight.

Spun or Waste S. Manufacture.—A very large amount of the raw material of the S. industry comes into commerce as pierced cocoons, floss, reelers' waste, and other forms which cannot be treated by the filature processes above alluded to. These materials are dressed, combed, formed into rovings, and spun by processes and on machinery analogous to that used in the alpaca or worsted wool manufactures.

Tussah Silks.—Under this name may be conveniently embraced the raw S. produced by a variety of moths other than the ordinary *Bombyx mori*, and to which a large share of attention has been devoted since the devastating disease manifested itself among the worms of that species. Several of them have, however, been known and used in Oriental countries for a long period. Of these the most important in India is the common Tussah or Tusser moth, *Antheria paphia*, which produces in the jungles throughout the whole of India, a large, firm, grey-coloured cocoon, from which a peculiarly strong S. is prepared. Of more limited range, but still producing a large amount of valuable fibre, are the Assam Tussah, *Antheria Assami*, the so-called Ailanthus worm. *Attacus cynthia*, originally a Chinese species; the Arrindy, or castor-oil plant silkworm of India, *Attacus ricini* (*vel Bombyx arrindia*), and the Bughy worm of Bengal, *Attacus mylitta*. The Yama-mai oak-feeding silkworm of Japan yields in that country a large amount of useful S. Of these species, the Yama-mai, the Arrindy, and the Ailanthus have received a large amount of attention in France; but the difficulty experienced in communicating to them delicate shades of dye-colours has hitherto greatly retarded their progress. Recent experiments, conducted by Mr. Thomas Wardle, F. C. S., however, indicate that these difficulties have been successfully overcome, and in the Indian section of the Paris Exhibition, 1878, that gentleman exhibited dyed Tussahs little if anything behind common S. in purity and delicacy of shade.

S. is readily enough distinguished from other animal and from vegetable fibres by appropriate chemical tests, and by its microscopic appearance. In a mixed fabric animal fibres may be dissolved out by the action of caustic potash, under a strong solution of which they readily dissolve. Among other animal fibres S. is most readily recognised by various tests which show the presence of sulphur in wool, &c., but from which S. is entirely free. In a solution of oxide of lead in caustic potash wool becomes black, and treated with nitro-prusside of sodium in a caustic alkali, wool gives a violet coloration, both reactions due to the presence of sulphur, and consequently not yielded by S. fibres. Under the microscope S. presents the appearance of a smooth cylindrical fibre destitute of external structure.

The imports of S., raw and thrown, into Great Britain during the year 1877, and the localities whence derived, were as follows:—Bengal, 154,350 lbs., value 10s. to 27s. per lb.; Chinese Taysuam, 554,268 lbs. at 13s. to 26s.; Chinese Tsaltee, 1,487,670 lbs. at 23s. to 29s.; Canton, 691,240 lbs. at 15s. 3d. to 23s. 6d.; Chinese thrown, 9184 lbs.; Se-chuen, 136,068 lbs. at 7s. 6d. to 16s.; Japanese, 929,700 lbs. at 20s. to 33s.; Bokhara, 83,880 lbs. at 8s. 9d. to 18s.; Patent Brutia, 15,400 lbs. at 11s. to 16s.; Italian raw 101,790 lbs., and thrown 240,120 lbs. at 36s. to 44s., the total imports being 4,155,197 lbs., a very great falling off as compared with certain previous years, the imports of 1871 having been upwards of 8,000,000 lbs., and in some years more than 9,000,000 lbs. have been imported. The imports from Bengal especially show a marked falling off, being less in 1877 than one-tenth part of what they were in 1867, and they have, excepting the year 1871, declined steadily between these points.

Silk'worm Gut is prepared from the caterpillars of the ordinary silkworm. The creatures are taken just at the point when they are about to begin spinning their cocoons, and immersed in a strong preparation of vinegar. In this they are left for a period varying according to the heat of the weather, a comparatively short time being necessary during the heat of the summer. The bodies are then taken, gently broken in two, and when drawn

out a long glutinous thread is formed by the silky secretion the caterpillar had formed for making its cocoon. These are separately stretched on a board, and held down by slits or pegs till they dry, and they then constitute the lustrous exceedingly strong line so well known to anglers under the name of 'gut.'

Sill'iman, Benjamin, an American chemist and geologist, born at N. Stratford, Connecticut, 8th August 1779, graduated at Yale College in 1796, and went to the bar in 1802, but in the same year was elected professor of chemistry at Yale. In 1818 he founded the *American Journal of Science and Arts*, of which he was sole editor until 1838, and joint editor along with his son until 1846. He resigned his professorship in 1853, but continued to lecture on geology until 1855. He died at New Haven, Connecticut, on November 24th, 1864. His principal works are a *Journal of Travels in England* (New York, 1810), *Elements of Chemistry* (1830), and *A Narrative of a Visit to Europe* (1853). See *Life of B. S.*, by G. P. Fisher (New York 1866).—His son, **Benjamin S.**, born at New Haven, 4th December 1816, became professor of applied chemistry at Yale in 1846, and succeeded his father as professor of chemistry in 1854, a post which he still (1878) holds.

Sill'oth, a town of Cumberland, England, on the Solway Firth, 20 miles W. of Carlisle by rail. It is of recent origin, and owes its rise chiefly to its mild climate. The sea-bathing is good, and the place is much resorted to by persons suffering from pulmonary complaints. With a fine dock and pier, it has become a principal port for steamers to the Isle of Man and Ireland. Pop. (1871) 1931.

Silu'rian Sys'tem, a great succession of strata intervening between the Cambrian formation and the base of the Old Red Sandstone. It received its name in 1835 from Murchison, who first carefully studied these rocks in S. Wales, the district once occupied by the ancient British tribe of the Silures.

The following is a convenient classification of the Silurian rocks in Britain; the numbers expressing the thickness of the beds being of course only approximate.

			Feet.
I. Lower Silurian.	1. Lower Llandeilo, Arenig, or Stiper Stones group		10,000
	2. Upper Llandeilo, or Llandeilo Flags		4,000
	3. Bala and Caradoc Beds		8,000
	4. Lower Llandovery Rocks		1,000
II. Upper Silurian.	1. Upper Llandovery Rocks	Mayhill group.	800
	2. Tarannon Shales		800
	3. Woolhope Limestone	Wenlock group.	50
	4. Wenlock Shale		1,000
	5. Wenlock Limestone		200
	6. Lower Ludlow Rocks	Ludlow group.	1,000
	7. Aymestry Limestone		50
	8. Upper Ludlow Rocks		600
	9. Downton Sandstones		200

In Great Britain, the Lower Silurian is typically developed in the counties of Merioneth, Caernarvon, and Caermarthen in Wales; in Shropshire and in the lake district; and in the S. of Scotland, throughout the greater part of the area included between lines drawn from Girvan to Dunbar, and from Dumfries to St. Abb's Head. In Ireland, besides occurring in numerous scattered localities, Lower Silurian strata are well seen in Wicklow, Wexford, and Waterford, in Limerick and Kerry, and in a band stretching from Cavan, &c., to county Down.

The Upper Silurian is typically shown in Denbigh, Montgomery, Radnor, &c., in Shropshire, Staffordshire, and Worcestershire; in Scotland, in patches in the neighbourhood of Girvan, Lesmahagow, &c., and on the Pentland Hills; in Ireland, in the counties of Galway, Limerick, and Kerry.

The S. S. is well developed in N. America, and the following are its chief subdivisions in the State of New York.

Silurian Strata of New York.	*British Equivalents.*
1. Trenton group: comprising the Chazy, Bird's Eye, Black River, and Trenton Limestones.	Lower Silurian.
2. Hudson River group: including the Utica Slates, &c.	
3. Clinton group: including the Oneida Conglomerate, Medina Sandstone, &c.	Llandovery Group.
4. Niagara Limestone.	Upper Silurian.
5. Saline group: including the Onondaga Salt-rock, &c.	
6. Lower Heidelberg group.	

On the Continent of Europe, the S. S. is well represented in Russia from St. Petersburg to the Baltic, in Bohemia, and in Scandinavia, where it has been studied respectively by Murchison, Barrande, and MM. Linnarson and Angelin. It is also well developed in Brittany, Spain, and Portugal.

The volcanic rocks of the period include great beds of traps and tuffs, interstratified with the Lower Silurian rocks, and well seen in Radnorshire and around Snowdon.

The Silurian rocks have as yet furnished no remains of land or fresh-water organisms, with the exception of a few fragments of Lepidodendron, and some spore-cases of Lycopods, which have been detected in the Upper Ludlow beds. Sponges, Foraminifera, &c., are well represented; but, geologically speaking, the most important fossils are the Graptolites. There are an enormous number of species, often restricted to thin beds, which are easily identified thereby in other localities. With the exception of Holothuroids, all the orders of Echinodermata are represented, the most notable being the Cystidea, which are especially characteristic of the Lower Silurian. Among the Arthropoda, Trilobites here attain their maximum of development, and Phyllopods, Ostracods, &c., are not rare. In the Mollusca, the Brachiopods and Orthoceratites show an extraordinary preponderance, the latter chiefly in Upper Silurian strata. Lastly, the earliest known fossil fish-remains occur in the Ludlow Formation; five or six species are known, referable probably to the sharks and ganoids.

Silu'ridæ, a family of *Teleostean* fishes belonging to the *Malacopterous* division of the order. The Siluroid fishes have spines formed by the first rays of the 'pectoral' or breast-fins. These spiny rays are largely developed, and may be erected or depressed at will. They are articulated by means of a ring-joint or *shackle-joint* with another bone. The fin-spines were at first regarded as presenting similar structures to the fossil fin-spines, or *icthyodorulites*, of *Elasmobranchiate* and *Ganoid* fishes; but they are really different, since the fin-spines of dogfishes, &c., are implanted in the flesh, and not articulated to another bone. The head in S. is protected by an armour-plating of dermal plates. Of this family the best-known species is the *Silurus glanis* of Swiss lakes and European rivers. This fish may attain a length of 6 or 8 feet, and may weigh from 300 to 400 lbs. It is common in the Danube and Elbe, and it or an allied species occurs in some of the N. American rivers. Attempts have been made to introduce it as a food fish into England. It is sluggish, and lies at the bottom of the water. Long tentacles surround the mouth. The colour is dark green above and yellowish below; the fins are blue and yellow, and the body is spotted. The *Malapterurus* (q. v.) of the Nile is one of the S.

Silva'nus (from *silva*, 'a wood'), an Italian divinity, guardian of trees, fields, and husbandmen. He marked out the boundaries of fields, he fostered the growth of trees, and he shielded flocks from destruction. The peasants had a festival in his honour, and offered him corn, milk, wine, and other rustic products. Through similarity of function, S. came to be identified with Pan and Faunus. His appearance was that of a hale and cheerful old man.

Sil'vas, or **Sel'vas** (Span. *selva*, 'a forest'), a name given to the immense wooded plains of the central Amazon, the area of which is estimated at from 750,000 to 1,000,000 sq. miles. Being low, with a level surface, they are flooded for a fifth part of their extent by the annual rise of the Amazon and its tributaries. The moisture and heat of the climate combine with the richness of the soil to render the forests luxuriant in the extreme, the trees being matted together by innumerable climbing plants, which form an impenetrable screen, so that even the jaguar is compelled to advance from tree to tree along the branches instead of along the ground. Unspeakably gloomy in the rainy season, the S. on its departure are brilliant with countless flowers. Birds, insects, monkeys, and snakes throng these regions, but human life is represented only by a few miserable Indians.

Sil'ver (Ger. *silber*), a metallic element very generally distributed, and which has been known from the most remote times. In the Book of Genesis mention is made of S., and it is frequently alluded to throughout the whole Bible, having formed the medium of currency before the art of coining was invented. The ancient Greeks, whose mines in Attica, Thessaly, and Epirus yielded abundance of the precious metals, also imported large quantities from foreign states, and till the 3d c. before the Christian era nearly all the coins of high value were S. The Romans, although

using the Greek S. coinage, had none of their own till about B.C. 269, when they obtained large quantities of S. from Spain, where rich mines had been very early wrought. In later times Austria, Germany, Spain, and Norway were the principal sources of S. in Europe; but on the discovery of America, and the opening up of the extremely rich mines of Mexico, Nevada, Peru, Chili, and Bolivia, the European mines were to a great extent neglected. The S. obtained in Great Britain is generally contained in galena, the most argentiferous coming from the Isle of Man, but it is also found in considerable quantities in different parts of the kingdom. Pure S. is a white metal, having when polished a brilliant lustre, which cannot be excelled by any other metal with the exception of steel. It is very malleable and ductile, and may be beaten into leaves $\frac{1}{100,000}$th of an inch in thickness, or drawn into very fine wire. S. has also great tenacity, a wire $\frac{1}{18}$th of an inch in diameter being capable of bearing a strain of 187 lbs. In hardness it is intermediate between copper and gold, and in thin plates it transmits light of a bluish-green colour. It melts at a bright red heat in a temperature of 1873° F. (1023° C.), and if exposed in a molten state to the air, takes up oxygen to the extent of 22 times its own bulk, which it liberates on cooling. The outer surface as it cools solidifies, but the escaping oxygen ruptures it, and forcibly expelling small globules of the molten S., causes a loss of the metal. The *spitting*, as this phenomenon is termed, may be prevented by the addition of a small portion of copper, lead, or gold, which prevents the absorption of the oxygen, 1 to 2 per cent. of the copper being a sufficient proportion. If S. be heated several times it becomes very brittle, and assumes a crystalline appearance. S. is the best conductor of heat and electricity known, and in the construction of delicate electrical instruments, when long metallic wires are required, it is preferred to any other metal.

Native S. occurs abundantly in S. mines, and is generally alloyed with gold, platinum, copper, iron, arsenic, cobalt, &c., most frequently with platinum. In Norway and in Mexico masses from 200 to 800 lbs. weight have been found; and it is said that a piece weighing 9000 or 10,000 lbs. was on one occasion discovered in the Johanngeorgenstadt mine. The ores of S. are numerous, and indeed there are few metallic ores which do not contain some traces of it. The following are the principal ores:—*Monochloride of S.*, or *Horn S.*, AgCl, containing about 75 per cent. S., is a soft bluish-grey mineral, found chiefly in Chili and Peru, but also in smaller quantities in Siberia, the Harz, Norway, Saxony, Brittany, and Cornwall; *Argentite, Vitreous Sulphide of S.* or *S. Glance*, Ag_2S., containing about 86 per cent. S., is a dark leaden-grey ore, soft, and with a metallic lustre when cut; it is found in Saxony, Bohemia, Hungary, and Mexico; *Brittle* or *Black Sulphide of S.* or *Stephanite*, Ag_5SbS_4, containing about 67 per cent. of S., a brittle, blackish mineral found at Allémont, Freiberg, Peru, and Mexico; *Polybasite* $(AgCu)_9(Sb,As)S_6$ containing from 64 to 72 per cent. of S; another form of the brittle sulphide is of an iron-grey colour, and found in Mexico, Chili, Nevada, and Idaho; *Dark Red S. Ore, Ruby S.* or *Pyrargyrite*, Ag_3SbS_3, a widely-disseminated ore, yields about 60 per cent. of S., and has a brilliant dark-red or reddish-black colour, with a metallic lustre; *Native Amalgam*, AgHg, containing about 36 per cent. of S.; a soft mineral of a bright silver-white appearance is also found in many localities; *Argentiferous Galena*, the sulphide of lead, which yields a variable amount of S., and is reckoned very rich when it contains 0·005. Among the other and less important ores of S. are:—*Dycrasite*, or *Antimonial S.*; *Proustite, Light Red S. Ore*, or *Arsenical Sulphide of S.*; *Sternbergite*, a sulphide of S. and iron; *Bromide of S.*, or *Bromyrite*; *Iodide of S.*, or *Iodyrite*; and *Chlorobromide of S.*, or *Embolite*.

The processes by which S. is extracted from its ores and separated from the other metals with which it combines in nature are numerous, but all fall under the two heads of wet and dry processes. Under wet processes are comprehended amalgamation of the metal with mercury, and the obtaining of solutions from which metallic S. is precipitated. In the dry processes the lead-yielding ores are enriched by concentration, and the final separation of lead and S. is effected either by a refining process similar in principle to cupellation, or by the Pattinson or zinc processes alluded to under LEAD. The ancient Saxony amalgamation process is not now prosecuted, but in Mexico and S. America a large proportion of the metal is yet obtained by an analogous method. The ores are first crushed in stamping mills, and ground under edge-stones with water and 1 to 5 per cent. of common salt to a uniform impalpable paste. After some days, there is added to it from ½ to 3 per cent. of 'magistral,' roasted iron and copper pyrites, and the whole is thoroughly intermixed. Mercury is then incorporated with it to the extent of six times the amount of S. the mass is calculated to contain, and in this condition it is submitted to a process of kneading every alternate day for a period varying from two to five months. Thereafter the mass is washed with water, which carries away the light gangue from the heavy amalgam. The amalgam is then strained in canvas bags to carry off the uncombined mercury, and the mercury and S. are subsequently separated by the volatilisation of the mercury by distillation. The theory on which this process is based is obscure; but in effect the interaction of the various substances results in the formation of a soluble chloride of silver which in the presence of mercury is decomposed; metallic silver is formed which amalgamates with the mercury, and at the same time a portion of the mercury combines with the liberated chlorine, forming calomel. The process has resulted in an enormous waste of mercury by the formation of this compound. It is calculated that up to the end of last century not less than six million cwts. of mercury had been lost by the process. For ores containing silver, copper, and iron alone, certain metallurgical methods are practicable whereby the S. is obtained in solution, from which it is easily precipitated in the metallic state by the addition of copper. In Augustin's process a soluble double chloride of S. and sodium is formed, when horn S. is treated in excess, with a hot solution of chlorides of common salt. Sulphur ores may also first be changed to chlorides by roasting with common salt and similarly treated. In Ziervogel's process sulphates of copper and S. soluble in hot water are obtained by roasting certain ores.

The important lead and S.-yielding ores are treated in the first place by the ordinary metallurgical processes (see LEAD), and the subsequent separation of the two metals is effected by various processes partly determined by comparative richness in S. of the compound. In the process of refining, the mixed metal is placed on the hearth of a reverberatory furnace, the hearth being specially prepared of a porous material so as to absorb the litharge formed in the process. The lead is oxidised in the heat of the furnace, and the litharge so formed separates in a fluid condition, and is absorbed by the porous hearth, leaving the S. unaffected. The heat is gradually increased as the separation proceeds, until the phenomenon of 'brightening' is observed (see CUPELLATION), after which it is withdrawn, and the metal left is gradually cooled. Pattinson's process is based on the fact that pure lead solidifies or crystallises on cooling more readily than lead containing S., and the higher the proportion of S. the less readily does the material solidify. Taking advantage of this fact, a mixture very rich in S. is gradually obtained by successive meltings in a series of vessels—pure lead solidifying and being ladled out in one direction, while in an opposite direction the S. becomes increasingly concentrated. The last portions of lead are removed in the reverberatory furnace as above indicated. The zinc process again, which is now extensively worked, is based on the fact that while zinc has no affinity for lead, it readily enters into combination with S. Thus zinc, when added to the molten compound, takes up the whole of the S., and as the mixture cools it rises and forms a hard cake on the surface. This is removed, and the zinc is subsequently separated from the silver by distillation. See LEAD.

The production of S. in different parts of Great Britain varies in quantity, the argentiferous ores of Cornwall and Devonshire being the richest, the poorest those of Derbyshire and Shropshire. The following statement shows the total yield of S. in the United Kingdom for the years mentioned:—

	1870	1871	1872	1873	1874	1875	1876
	oz.	oz.	oz.	oz.	oz.	oz.	oz.
England	443,546	434,358	342,516	221,556	192,160	140,978	148,047
Wales	159,993	145,216	134,028	124,553	137,633	142,618	146,216
Isle of Man	172,528	176,631	145,433	163,058	161,612	183,524	170,105
Ireland	2,815	....	1,040	4,420	6,555	6,935	6,840
Scotland	5,680	5,285	5,900	10,720	11,317	13,303	12,214
Total	784,562	761,490	628,917	524,307	509,277	487,358	483,422

The total yield of the United Kingdom for 1877 was 501,435 oz. On the Continent the yield of S. has of late years been less

than formerly. In Spain the mines in the district of Guadalajara are considered the most important, and yield an average of 32,390 lbs. troy annually, and according to Phillips the total produce of Spain in 1865 was about 110,000 lbs. troy. The yield of Austria in 1876 was 84,676 metrical cwts. of ore, whence 25,165 kgs. of metal, Saxony 80,000. The Hartz 28,000, Germany 70,000, France 18,000, Sardinia 25,000, Norway and Sweden 18,000, and the Russian Empire 58,000 lbs. troy. No S. is obtained from Africa, and the production of the Old World is comparatively small. America yields by far the largest quantity of S.: the amount produced has been rather exaggerated, there being no reliable statistics, but there is reason to believe it is about 1,000,000 lbs. troy, the largest amount being from the Comstock lode in Nevada. In 1877 this lode yielded $20,139,860, and the other mines of Nevada $51,117,624. Mexico, which in the early part of the present century yielded annually 1,440,650 lbs. troy, yields at present 1,600,000 lbs. troy annually; Bolivia produces annually about 450,000 lbs. troy; Chili and Peru each yielding about 300,000 lbs. troy. See A. D. Anderson's *S. Country, or the Great S.W.* (New York 1877).

Medicinal Properties of S.—The pharmaceutical preparations of S. are the *nitrate* and the *oxide*. The *cyanide* is contained in the pharmacopœia of the United States, but it is used solely for making hydrocyanic acid. *Nitrate* of S. coagulates albumen, and acts as a caustic on living tissues. A dilute solution acts as an astringent, and is apparently alterative to the nutritive processes. When taken in large quantities it produces gastro-enteritis, and acts directly upon the nervous system. When taken in small quantity for a lengthened period the skin acquires a bluish-slate colour, the discoloration being due to the presence of *nitrate* of S. in the skin. In cases of poisoning by S. both convulsions and paralysis are present, finally ending in death by asphyxia, the results of chronic poisoning being analogous to those produced by antimony, arsenic, and probably other metallic poisons. *Nitrate* of S. is most frequently applied for its local action, either upon the surface of the body, or upon those mucous membranes that can be reached directly. As a caustic and an alterative it may be applied to ulcerated surfaces, and as an antiphlogistic it is employed in various inflammations of the mucous membranes, such as *conjunctivitis, faucitis, laryngitis, urethritis*, &c. Internally, nitrate of S. is useful as a stomachic, in certain forms of *dyspepsia*, in chronic *gastritis*, and in *gastric ulcer*. It is sometimes of great service in *chronic enteritis* or *colitis*, especially if there be ulceration. It should be administered in the form of pill in doses of ¼ to ½ a grain three or four times a day, taken when the stomach is empty. *Oxide* of S. is given in the same cases of nervous disease as the nitrate, and it is said not to discolour the skin. The dose is a grain given in pill three times a day.

Sil'vering, the art of covering metal, wood, glass, or other material with silver. See ELECTRO-METALLURGY and PLATING.

Simaruba'ceæ is a dicotyledonous natural order, embracing shrubs or trees with bitter bark; pinnate leaves without stipules; small regular flowers; hypogenous stamens with 2-celled anthers, and one-sided fruit carpels. It is limited to the tropical zones of America, Asia, and Africa. The most important representatives furnish Quassia (q. v.); and among other genera the bark of *Simaruba amara* is a good tonic, and is used in the W. Indies for dyspepsia, diarrhœa, and chronic dysentery; *S. glauca* yields a glutinous juice, used in Cuba for certain skin diseases; the kernel of *Simaba Cedron* of New Granada is universally believed to be an effective antidote for the bites of snakes and other noxious animals, and is further used in intermittent fever and rheumatism; the seeds, bark, and sub-acid leaves of *Balanites Roxburghii* are employed in Indian native medicine; the very bitter bark of *Picrasma* or *Nima quassioides* is administered as a tonic and stomachic; and *Ailanthus malabarica* gives a resin used in medicine and incense.

Simbirsk', a government of Russia, bounded N. and N.W. by Kasan and Nijni-Novgorod, W. by Pensa, S. by Saratov, and E. by the Volga. Area, 19,108 sq. miles; pop. (1870) 1,205,881. The surface is mostly level, and is watered by the Sura and its affluents. The soil is fertile, but the greater part is under pasture; three-tenths is covered with wood.—S., its capital, on the right bank of the Volga, at the mouth of the Sirjaga, 78 miles N. of Sysran, has 16 churches, 2 monasteries, manufactures of leather, soap, and candles, and a great fishery and transit trade on the Volga. In 1865 it was almost destroyed by fire. Pop. (1870) 26,822.

Sim'eon, the second of Jacob's sons by Leah, took part in the massacre of the Shechemites, and was selected by Joseph as the hostage for Benjamin. The *tribe* of S. received the S.W. corner of Canaan as its share of the conquered land, and it was still partially in possession of that territory at the time when the chronicler wrote (1 Chron. iv. 41–43).

Sim'eon, Rev. Charles, born at Reading, Berkshire, 24th September 1759, from Eton proceeded to King's College, Cambridge, where he gained a scholarship (1779) and a fellowship (1782). Having taken orders, he became vicar of Trinity Church, Cambridge (1783), and vice-provost of his college (1790), both which posts he retained down to his death, 13th November 1836. A zealous preacher and earnest promoter of missionary enterprise, S. may be looked on as the father of the Evangelical or Low-Church party, whose permanence he sought to ensure by organising a system for the purchase of advowsons in the Church of England, to which evangelically-minded preachers only should be presented. His *Horæ Homileticæ*, comprising 2536 sermons and 'skeleton-sermons,' were edited by the Rev. T. H. Horne (21 vols. 1832–33), and his Life has been written by the Rev. W. Carus (Lond. 1847).

Sim'eon Styli'tes. See PILLAR SAINTS.

Simfero'pol, a town of S. Russia, in the Crimea, capital of the government of Taurida, on the Salghir, 49¾ miles N.E. of Sebastopol by rail. It consists of a European and a Tartar quarter (*Ak-Metched*), and is surrounded by productive gardens and orchards. It has 7 churches, 4 mosques, large barracks, and government buildings, and exports a great quantity of fruit. Pop. (*St. Petersb. Cal.* 1878) 17,129.

Sim'ia. See MONKEY.

Sim'ilar, in geometry, when applied to plane figures or solids, signifies exact correspondence in shape without regard to magnitude. Thus all equilateral triangles are S., as also all squares, circles, cubes, spheres, &c. Parallel sections of any cone or pyramid give S. figures.

Sim'ile (Lat. a 'likeness') is a figure of speech which consists in the *formal* expression of the resemblance perceived or supposed to exist between two different things. Ex., 'As the stars, so shall thy seed be;' 'When ye pray, use not vain repetitions as the heathen do;' 'Pleasures are like poppies spread, you seize the flower, its bloom is shed.'

Sim'la, the chief town of a district of the same name in the Punjaub, and the most important hill sanitarium in British India, about 98 miles N.N.E. of Umballa, the nearest railway station, which is about 1170 miles by rail N.W. of Calcutta. S. is 7156 feet above the sea. Pop. (1868) 7037, but the numbers fluctuate greatly according to the season. Situated on a series of wooded hill ridges, covered with deodaras, rhododendrons, and an innumerable variety of ferns, and with an equable temperature that rarely exceeds 70°, S. is a perfect elysium to Anglo-Indians who have come from the burning plains of Hindustan or the swamps of Bengal. For many years past it has been the permanent headquarters of the supreme government of India for more than six months of the year. The Governor-General and the Commander-in-Chief annually remove hither with their entire staff from Calcutta, and even the *Gazette of India* is printed here during their residence. It is in contemplation to erect a large block of buildings for the clerks thus transferred, who now receive extra allowances to cover the increased cost of living at a place to which nearly all commodities have to be carried by porters. This tract of hill country was first acquired by the British in 1816, as a result of the Gurkha war, and has since been augmented by purchase, lapse, and exchange. The first house was built in 1819; Lord W. Bentinck was the first governor-general to select it as his summer quarters. There are now churches, schools, hotels, clubs, bank, and breweries; and all the environs are dotted with picturesque villas. The chief schools are the Roman Catholic Orphanage for the children of soldiers, on the model of the Lawrence asylums; the Mayo industrial schools, for the orphans of poor civilians; Bishop Cotton's school and the Punjaub girls' school, both for the higher

education of the children of well-to-do Europeans.—The *district* of S., which is entirely surrounded by petty native states, has an area of 18 sq. miles, of which only about 12 are cultivated. Pop. (1868) 33,995. The crops are wheat, Indian-corn, ginger, and poppy. There is one small tea-garden, and great efforts are being made to grow hops. The neighbouring mountains yield lead, iron, and slate. For a vivid description of S. life, see *Chronicles of Dustypore* (Lond. 1875).

Simms, William Gillmore, a voluminous novelist and poet, was born at Charleston, S. Carolina, 17th April 1806. He began life as a druggist, then went to the bar, and ultimately took to journalism and literature. He died at Charleston, 11th June 1870. S. published twelve volumes of poems, two dramas, innumerable essays and biographies, and an edition of the seven doubtful plays attributed to Shakespeare. It is as a novelist, however, that he is remembered in America. His tales are after the manner of Cooper, the material for most of them being taken from the Revolutionary War. His best works of fiction were republished in New York in 19 vols. (1853-59), and a new edition in 17 vols. was published in 1865.

Simo'da ('lowland'), a port at the extremity of Cape Idzu, on the S. coast of the island of Nipon, Japan, 67 miles S.W. of Yokohama. It was thrown open to European commerce in 1857. It is subject to earthquakes, by one of which, in 1854, it was frightfully desolated. Pop. about 7000.

Simon, Jules, properly **Jules François Simon Suisse,** a French philosopher and politician, was born at Lorient, department of Morbihan, on December 31st, 1814. Educated at the École Normale, Paris, he succeeded his master, Cousin, in the professorship of philosophy at the Sorbonne in 1839. In 1852 he lost this post on account of his refusal to take the oath of allegiance to Napoleon III., and afterwards held several courses of lectures in different towns in Belgium, on philosophy and education. He was elected to the French Academy in 1863, and in the same year was returned to the Chamber of Deputies, where he took his place among the members of the moderate Left. After vigorously opposing the plebiscite of 1870 and the declaration of war with Prussia, he became a member of the Provisional Government on the 4th September 1870, and afterwards occupied the position of Minister of Education in the Thiers Government from 1871 to 1873. In 1875 he was elected to the Senate, where he became the leader of the Republicans; and from December 13th, 1876, till May 16th, 1877, he was Minister of the Interior under President Macmahon, whose strongest opponent he had formerly been. He afterwards became the editor of the *Echo Universel*, a moderate Republican organ. Among his principal works are *Histoire de l'École d'Alexandrie* (1844), *Le Devoir* (1854), *La Religion Naturelle* (1856), *La Liberté de Conscience* (1859), *L'Ouvrière* (1860), *L'École* (1864), *Le Travail* (1866), *La Politique Radicale* (1868), *Le Libre-Échange* (1870), *Souvenirs des 4 Septembre* (1874), and *Le Gouvernement de M. Thiers. 8 Février* 1871-24, *Mai* 1873 (Par. 1878), a most valuable contribution to the history of the critical period with which it deals.

Simon, Richard, the father of the historical exegesis of Scripture, was born, 13th May 1638, at Dieppe, where he studied under the fathers of the Oratory, entering their order in 1662. After lecturing for a time on philosophy in the College at Juilly, he went to Paris to prepare a catalogue of the Oriental MSS. in the library of the Oratory, returning to Juilly in 1668. Two years afterwards he was ordained a priest, but in 1678 was forced to withdraw from the Oratory, whose chief members feared the consequences of his doctrines, and retire to the village of Belleville, in Normandy, of which he had been appointed curé in 1676. In six years he resigned his cure, and went to Paris, to devote the remainder of his life to study. He died at Dieppe, 11th April 1712, leaving his books and MSS. to the Cathedral of Rouen. In S.'s famous *Histoire Critique du Vieux Testament* (Par. 1678; imperfectly reprinted by the Elzevirs at Amsterdam, 1680, but accurately by Leers at Rotterdam, 1685), which was suppressed at the instance of Bossuet, he maintains that the Pentateuch was not the work of Moses, but of scribes of the time of Ezra. Though his *Histoire Critique du Texte du Nouveau Testament* (Rotterdam, 1689), and *Histoire Critique des Versions du Nouveau Testament* (*ib.* 1690), were well received, his *Histoire Critique des Principaux Commentateurs du Nouveau Testament* (*ib.* 1692) provoked yet greater hostility than his work on the Old Testament. Its bold strictures on the teaching of the Fathers, especially on Augustine's doctrines of original sin, efficacious grace, and predestination, which he characterised as innovations foisted on the Western Church, were vigorously combated by Bossuet in his *Défense de la Tradition et des Saints Pères.* Of the many other works of S., his chief one, the *Nouveau Testament traduit en Français, avec des Remarques Littérales et Critiques* (Trevoux 1702), was suppressed by the influence of Bossuet and Cardinal de Noailles. See Trochon, *R. S. et la Critique biblique* (Rouen 1848).

Simon'ides (1) of Amorgos, the second, both in time and reputation, of the three great iambic poets of early Greek literature, was the son of Crines, a Samian, who led a colony to Amorgos, and there founded three cities, Ægialus, Minoa, and Arcesine. The period of S. is somewhat uncertain, but it seems to lie between 693 and 660 B.C. His chief works, according to Suidas, consisted of an elegy in two books, and a number of iambic poems. On the latter his reputation rests. They are of two kinds, gnomic and satirical. As a poet S. was distinguished by force, fitness, and fulness of expression, combined with exquisite simplicity. His fragments are included in most of the collections of the Greek poets; in Brunck's '*Analecta;* in Jakobs's *Anthologia Græca;* 'and in Bergk's *Poetæ Lyrici Græci.* A complete edition was edited by Welcker (Bonn. 1835, 8vo.). **Simonides** (2), the most celebrated elegiac poet of Greece, was born at Iulis in Ceos, an island in the Ægean Sea, 556 B.C. His paternal grandfather, also a poet, bore the same name. S. was highly educated in music and poetry with a view to following these arts as a profession. The invitation of Hipparchus induced him to leave his native isle and to reside in Athens, where then lived Anacreon and Lasus, Pindar's teacher. No intimacy seems to have existed between S. and his two rivals. After the expulsion of Hippias (510 B.C.) he probably resided in Thessaly, poorly patronised by the Aleuads and Scopads. Shortly before the Persian invasion he returned to Athens, writing the while elegies, epigrams, dirges, &c., bearing on the battle of Marathon (490 B.C.), and wresting the palm from his powerful rival Æschylus. In 477 B.C. S., now eighty years of age, was victor for the fifty-sixth time in the poetical contest at Athens. Shortly thereafter he went to reside at the court of Hiero of Syracuse, where he died (467 B.C.) in his 90th year. S. is credited with completing the Greek alphabet by the addition of the double letters and long vowels, and with the invention of a mnemonic art. He made literature a profession and earned its legitimate rewards. The morality of his writings is high. Pindar, perhaps with reason, accuses him of avarice. Yet the attentions paid to S. by Hipparchus at Athens, Pausanias at Lacedæmon, and Hiero at Syracuse, attest the high estimation in which he was held by the magnates of his time. Moreover, the people of Syracuse showed him a degree of honour rarely accorded to poets in their lifetime, and after his death erected a splendid monument to his memory. His compositions excelled in sweetness (whence his surname *Melicertes*) combined with the most tender pathos, rare poetic conception, and harmony of expression. Though inferior in originality and passionate intensity to some of his predecessors and contemporaries, his lays were esteemed by Hiero more than the odes of Pindar and the strains of Bacchylides. His works, which included dramatic, elegiac, epigrammatic, and lyrical pieces, now for the most part lost, were written in the Doric dialect. S. was the inventor of the new Elegy (*elegos*), the '*queremonia*' of Horace, as distinguished from the old martial poem (*elegeion*), also written in hexameters and pentameters, whose origin is attributed to Callinus (B.C. 776). In addition to the collections referred to in the preceding article, see the standard edition of Schneidewin (Bruns. 1835).

Simonose'ki, a port of Japan at the S.W. extremity of the island of Nipon, on the Straits of S., otherwise called Van der Capellen Straits, dividing Nipon from Kiusiu. It is about 225 miles W.S.W. of Hiogo, and 472 miles W.S.W. of Yokohama. It has a very active coasting trade. In 1864, owing to a violation of international law on the part of the Japanese, it was bombarded and destroyed by British, American, French, and Dutch men-of-war. Pop. about 10,000.

Sim'ony (so called from its resemblance to the sin of Simon Magus) in English law is an offence consisting in the presentation to an ecclesiastical benefice for a reward. By 31 Eliz. c. 6, a simoniacal presentation is declared void, and two years' value of the benefice forfeited, one-half of the forfeit to go to the crown, the other half to the person suing; and the person accepting the benefice is for ever debarred from holding it. 9 Geo. IV. c. 94, however, legalises engagements for the resignation of ecclesiastical preferments in favour of one of two persons specially named, being by blood or marriage an uncle, son, grandson, brother, nephew, or grand-nephew of the patron. The bond must be entered into before the presentation, and entered in the registry of the diocese. The resignation in terms of the bond will be void, unless one of the presentees named in it is presented within six months after notice of resignation has been given to the patron.

Simoom' (Arab. *samûm*, from *samma*, 'hot'), a hot arid wind peculiar to the sandy deserts of Africa and Western Asia, and the districts bordering these. The air, heated by contact with the noonday burning sand, ascends, and the influx of colder air from all sides forms a whirlwind or miniature cyclone, which is borne across the desert laden with sand and dust. It occurs usually at the time of the equinoxes, and is greatly dreaded by travellers crossing the desert. Its intense dry parching heat, combined with the cloud of dust and sand which it carries with it, has a very destructive effect upon both vegetable and animal life. In the great sandy track known as the Sahara, which stretches across nearly the whole length of N. Africa, these winds are especially frequent at certain seasons of the year, and are felt, variously modified by the nature of the earth's surface over which they have passed, in the countries bordering the Mediterranean. The hot moist *sirocco* of S. Italy, the blighting *samiel* of Turkey, the irritating *solano* of Spain, and the *hamsin* of Egypt, have their origin as simooms in the Sahara.

Sim'ple Con'tract. See CONTRACT.

Sim'plon (Ital. *Sempione*), one of the Lepontine Alps in the canton of the Valais, Switzerland, whose culminating point (*Monte Leone*) is 11,695 feet high. It gives a name to the S. pass which leads from Brieg, in the Rhone valley, to Domo d'Ossola in Italy. The total length of this pass is 39½ miles, its maximum elevation is 6594 feet, its breadth 30 feet; and it has 611 bridges. Near the summit stands a *Hospice* where travellers are received. Besides this there are nineteen refuges for storm-stayed tourists. At 12½ miles' distance from Brieg is the S. village (altitude 4856 feet). The road over the pass was constructed by Napoleon I. in 1800–6 at a cost of £720,000.

Simp'son, Sir James Young, a celebrated Scotch physician, was born at Bathgate, Linlithgowshire, June 7, 1811. In 1825 he entered Edinburgh University, and graduated M.D. in 1832. He had already devoted considerable attention to obstetric medicine, and in 1840 his established reputation secured him the chair of midwifery in Edinburgh. At once he took a foremost position as a teacher, and to the end of his life maintained his great popularity as a lecturer in spite of an ever-increasing practice. In 1847 S. was appointed one of Her Majesty's physicians for Scotland, and the same year made the bold experiment which established chloroform as an anæsthetic in obstetrics, an innovation in medical practice which excited much opposition and controversy. His fame now spread rapidly and widely. In 1853 he was nominated a foreign associate of the Paris Academy of Medicine, and in 1856 obtained from that Society the Monthyon Prize for the most important benefits done to humanity. He was knighted in 1854 and created a baronet in 1867. He died May 6, 1870, and received the honour of a public funeral. S. was not only a great physician, but a brilliant archæologist, and found time to compose numerous works, medicinal and archæological, including *Homœopathy, its Tenets and Tendencies* (3d ed. 1853); *Obstetric Memoirs and Contributions* (3 vols. 1855-56), and *Acupressure, a New Method of Arresting Surgical Hæmorrhage and of Accelerating the Healing of Wounds* (1864). His principal works were re-published collectively in 1871, and his *Archæological Essays* in 1872. A statue of S. was unveiled in Edinburgh in the spring of 1877. See Professor Duns' *Memoir of Sir J. Y. S.* (1873).

Sim'rock, Karl, an illustrious German scholar and poet, born at Bonn, 28th August 1802, proceeded in 1820 from the Lyceum to the University of his native city, and here, while studying law, became imbued with Heine's admiration of the older German literature. At Berlin, where he concluded his juristic studies, he published a metrical translation of the *Nibelungenlied* (1827; 32d ed. 1875), and wrote for various journals, till an outspoken article on the July Revolution closed the legal career against him. Accordingly in 1832 he returned to his Rhenish birthplace, and spent some years in busy literary retirement. Appointed Professor of the German Language and Literature at Bonn (1850), he laboured as such without intermission down to his death, 18th July 1876. No man did more than S. to foster German nationality by popularising the ancient national literature, in modernisations of the *Nibelungenlied*, *Gudrun* (8th ed. 1873), *Kleines Heldenbuch* (3d ed. 1874), and *Amelungenlied* (2d ed. 1863), which together constitute his *magnum opus*, the *Deutsches Heldenbuch*, in versions of the mediæval chivalric romances, and in collections of German Legends (3d ed. 1876), Proverbs (2d ed. 1863), Riddles (1874), &c. His own *Gedichte* (1844) have often the genuine epic ring, and from his numerous miscellaneous writings may be singled out the *Lauda Sion* (1850), *Quellen des Shakespeare* (2d ed. 1872), and *Handbuch der Deutschen Mythologie* (4th ed. 1874). See Dr. N. Hocker, *Karl S., sein Leben und seine Werke* (Leips. and Lond. 1877).

Sim'son, Robert, a celebrated Scotch mathematician, was born at Kirton Hall, in Ayrshire, October 14, 1687. In 1701 he entered the University of Glasgow with the intention of studying for the Church. In mathematics, however, and especially in ancient geometry, he found a more congenial study, and his appointment in 1711 to the vacant mathematical chair at Glasgow determined his future career. He retired from his professorial duties in 1761, and died October 1, 1768. He devoted almost his whole life to the restoration of the works of the Greek geometers. In 1746 he published the *Loci Plani* of Apollonius, and this was followed by Euclid's *Elements* and *Data* (1758). In 1776 Earl Stanhope published at his own expense S.'s restoration of Euclid's Porisms, and two books *De Sectione Determinata* of Apollonius, together with a tract on the limits of ratios and on logarithms all written by S. An edition of Pappus was also found among his manuscripts, and was sent to the University of Oxford. See Dr. William Trail's *Life of S.* (Lond. 1822).

Sin, according to 1 John iii. 4, is lawlessness. This would be as explicit and complete a definition as could be framed, if it were absolutely certain what *law* is. Some consider the above definition to be complete in itself, since the Apostle referred to the moral or Mosaic law. Others, not satisfied that the Mosaic law covered everything, consider that a test of what is sinful is furnished by conscience, or an innate moral faculty. But this, it is alleged, does not supply an absolute test, since the consciences of no two persons are alike. According to the conscience of the S. Sea Islander it was right for him to steal another man's wife; wrong for another man to steal his. It has, therefore, been argued that the only real test of law in relation to S. is the tendency of actions, upon the whole and in the long run, to produce happiness or to produce pain, suffering, and misery. Not that having the one tendency or the other constitutes an action virtuous or sinful, but that this is the only valid criterion of what is the will of God and what is lawlessness. The teaching of Scripture, however, carries the doctrine of S. into a higher region. It recognises the 'exceeding sinfulness of S.;' *i.e.*, whatever shape S. may take, its true character and its supreme offensiveness are only perceived when it is viewed in its relation to the infinitely pure God and Father of all men. See J. Müller, *Die Christl. Lehre von der Sünde*.(Eng. trans. Edinb. 1853); Hodge, *Syst. Theol.* (Edinb. 1873); Tulloch, *The Christian Doctrine of S.* (Croall Lectures, 1876).

Si'nai. In the third month after their departure from Egypt, the Israelites arrived in 'the desert of S.,' and 'camped before the mount' (Exod. xix. 1, 2). The mountain in question is constantly called S. so long as the Israelites stayed there (xix. 18, 20, 23, &c.), but afterwards it is generally spoken of as Horeb (Exod. xxxiii. 6; Deut. i. 2, &c.); the former name being used, however, when a more exact description of the place is to be given. From

this it may be inferred that, while the two names were to a certain extent synonymous, Horeb was a more general name than S., perhaps pointing to some natural feature (the name—Heb. *Choreb*—means 'desert'); in other words, that Horeb was the group of mountains of which S. was a particular summit. The peninsula of S. stretches S. into the Red Sea. It is a right-angled triangle of about 11,055 sq. miles, whose hypotenuse extends along the Bay of the Suez on the W., and whose N. side intersects the desert El-Tih, while the other side is the shore of the Gulf of Aila. To the peninsula of S. the Israelites travelled after their passage of the Red Sea. Beke will have the Mount S. of the Bible on the E. side of the Gulf of Aila, but this is hardly credible. It is more difficult to decide between the Jebel Musa of tradition, Ras Sufsâfeh, and the Serbal. The few topographic details in the Bible most naturally point to the nearly isolated Jebel Musa (confirmed by the results of the expedition sent out from England in 1868 by the 'S. Survey Fund'), between which and the plain on the N., Er-Raha, stood the two horns of Ras Sufsâfeh (6830 feet). Jebel Musa (7363 feet) cannot be seen from Er-Raha, but from the smaller plain Wady Sebaiyeh, which with the declivities to the E. affords room for a great number of people. It rises from great rows of granite blocks, and extends from N.N.W. to S.S.E 1½ miles, with a breadth of ⅔ miles. S.S.W. of Jebel Musa is Jebel Katharin (over 8000 feet), the highest point of the peninsula, and N.E. is 'Aribeh (Arab. form of Horeb), which even in the 6th c. A.D. was recognised as Horeb by Antoninus Martyr. Ritter, *Palästina und Syrien* (Berl. 1848–55); Tobler, *De Locis Sanctis quæ perambulavit Antoninus Martyr* (St. Gall 1863); Fraas, *Aus dem Orient* (Stuttg. 1867); Ebers, *Durch Gosen zu S.* (Leip. 1872); Stanley's *S. and Palestine* (new ed. 1872); Palmer, *The Desert of the Exodus* (Camb. 1872); Bædeker's *Palestine and Syria* (Leip. 1876), and Wilson & Palmer's *Ordnance Survey of the Peninsula of S.* (Lond. 1872).

Sina'pis. See MUSTARD.

Sin'clair, a Scottish family of Norman origin, whose founder, William de Sancto Claro, obtained from David I. a grant of Rosslyn in Midlothian. A William S., comrade-in-arms of Robert I., was charged with the Douglas to bear that monarch's heart to the Holy Land, and with the Douglas was slain by the Moors of Spain (1330); his son and successor, Henry, by marriage with Isabel, daughter of the last Earl of Stratherne, and grand-daughter of the last Jarl of Orkney (q. v.), himself became Earl of Orkney and Stratherne, holding his island fief alike from Hakon VI. of Norway and Robert II. of Scotland. William, the latter's grandson, was Lord High Admiral and Chancellor of Scotland, in 1455 received the earldom of Caithness, but in 1471 must relinquish Orkney to James III. (q. v.), and was poorly compensated by the castle of Ravenscraig in Fife. Rosslyn's exquisite chapel, reared by him (1446), attests the splendour of one whose court was attended by seventy high-born dames and more than 200 gentlemen; but at his death his wide domains were parcelled among three sons, William Lord S., Sir Oliver S. of Rosslyn, and William Earl of Caithness. Sir Oliver's line became extinct in 1778; the last of the eldest line, Catherine S., married in 1659 John S. of Herdmanston, lineal descendant of a Henry de Sancto Claro, who in 1162 had received a grant of Herdmanston in Haddington, and from this marriage the present Lord S., the Earls of Orkney and Rosslyn, and the Duke of Sutherland, trace their descent through female ancestors. From William, the third son, come the Earls of Caithness, and from them in the 16th c. sprang the Ulbster branch, to which belonged **Sir John S.,** born at Thurso Castle, 10th May 1754. From the tutorship of the poet Logan he passed to the High School of Edinburgh, and having studied at the university of that city, of Glasgow, and of Oxford, was admitted member of the Scotch Faculty of Advocates (1775), and also called to the English bar (1782). He succeeded his father in the family estates (1770), and entered Parliament for Caithness-shire (1780), and for thirty years of parliamentary life he devoted himself to the improvement of agriculture, commerce, and finance, publishing on these and miscellaneous subjects no fewer than 39 volumes and 367 pamphlets. A *History of the Public Revenue* (2 vols. 1784) established his reputation as an economist; in 1786, the year that Pitt created him a baronet, he made a scientific tour through northern Europe; in 1791 he established the British Wool Society, and the Board of Agriculture in 1793. On his own estate he bred 6000 Cheviot sheep, planted 345,000 trees, and by 1812 redeemed 11,209 acres of uncultivated land; while to his vast *Statistical Account of Scotland* (20 vols. 1798), compiled from contributions by the ministers of each separate parish, all Scotland is deeply indebted, since its exposure of numerous abuses led to their redress. S. held at the same time twelve different offices, including the colonelcy of two battalions raised at his own expense (1794); he was sworn of the Privy Council (1818), and was an active member of countless foreign and home societies down to his death at Edinburgh, 21st December 1835. See the *Correspondence of Sir John S.* (2 vols. Lond. 1831), and a *Life* (2 vols. Edinb. 1837) by his third son John. The latter, born 20th August 1797, was Archdeacon of Middlesex from 1842 till his death, 22d May 1875, and further published *Dissertations Vindicating the Church of England* (1833), *Sketches of Old Times and Distant Places* (1875), &c. The fourth son, Archibald (born 20th September 1801; died 1st June 1859), rose to the rank of captain in the Royal Navy, and wrote *Reminiscences of the Discipline, Customs, and Usages in the R. N. in the 'Good Old Times'* (1859). His fourth daughter, Catherine (born 17th April 1800; died 6th August 1864), is better known by her *Modern Accomplishments* (1836), *Holiday House* (1839), *Scotland and the Scotch* (1846), &c., than is his grandson, Sir John George Tollemache S., Bart. (born 8th November 1825), by a *Defence of Russia* (1877).

Sin'ecure is an office with revenue without duty attached to it. 3 and 4 Vic. c. 113 abolishes S. rectories.

Sin'ew. See TENDON.

Sin'gapore, a British settlement in the East Indies, situated on the S. extremity of the Malay Peninsula, and consisting of the island of S., and about 59 islets lying S. and E. of it, in the Straits of S. Area, 224 sq. miles; pop. (1871) 97,111 (74,348 males), of which 1946 were Europeans and Americans. The surface of the island is undulating, and largely covered with wood; the higher grounds are seldom more than 100 feet above the sea, and the shores are low, surrounded with mangrove trees, and indented with salt creeks. The soil is rich, and as the island is less than 100 miles from the equator, there is no variety in the seasons. The mean temperature in the shade for the year 1875 was 79° F. Reckoning complete saturation at 100, the mean humidity was 77, and the total rainfall was 93·96 inches. Tropical fruits and vegetables are produced, and cocoa, pepper, gambier, and sugar are raised for export. S. is infested with tigers, and as many as 300 people are annually carried off by their ravages. S. had, in 1875, 17 schools with 1653 scholars; in the same year its revenue was £327,007; expenditure, £383,611. S. was first taken possession of by Sir Stamford Raffles in 1819, and finally yielded by the Sultan of Jahore in 1824. In 1826 it was placed under the provincial government of the Straits Settlement, but was with Malacca and Prince of Wales Island constituted a separate government in 1851.—**S.,** the capital, and the emporium of Southern Asia and the Indian Archipelago, is situated at the mouth of a stream on the S. side of the island. It extends for 2 miles along the shore, and has two fine harbours. A second graving-dock, 450 feet long by 60 wide, is now (1878) being constructed at a cost of £48,000. S. has been declared a free port, and is the mart of trade for China, the Dutch and Spanish islands, and the native powers of the Archipelago. In 1875 there entered S. 2261 British and foreign vessels of 1,283,786 tons (1378 of 809,610 British), and cleared 2348 of 1,003,601 tons (1384 of 700,479 British). Of native vessels, there entered 3171 of 83,850 tons, and cleared 6492 of 83,129 tons. The total value of imports from foreign trade in the same year was £8,263,817, and exports £7,712,772. In the trade between the Settlements, the imports were valued at £1,036,495, exports at £1,131,875. The principal imports were rice, bullion, hardware, opium, pepper, sago, cotton goods, coals, coffee, apparel, raw silk, sugar, tobacco, woollens, and tea; and exports, bullion, cotton goods, gambier, rice, opium, pepper, sago, and silk. Pop. (1871) 61,752.

Singbhum, a non-regulation district of the province of Chota Nagpur, Bengal, British India, lying among the hills W. of Midnapore. Area, 3897 sq. miles; pop. (1872) 322,396. It

contains several semi-independent states; and the tract known as the Kolhan, where the fighting Hos or Larka Kols, an aboriginal tribe who have often given much trouble, are now most peaceably settled. The products are rice, grown upon artificial terraces in the valleys; *tussur* silk, lac, and beeswax; iron, limestone, and soapstone. Copper also was formerly mined. The chief town is Chainbasa, where a large annual fair is held. The inhabitants are almost all hill tribes, among whom the Christian missions are most successful. See Dalton's *Ethnology of Bengal* (Calcutta, 1872).

Singh (Sansk. *sinha*, 'a lion'), a name commonly adopted in India by the Rajput or military and ruling caste, and also by the fighting men among the Sikhs.

Singhá'ra Nut. See TRAPA.

Sing'ing, the production of music by the human voice. The principal requisites in singing are a good voice, a correct ear, and a sound rudimentary knowledge of music. By careful practice, purity of tone and flexibility of execution may be attained, and the sweetness, brilliancy, and compass of the voice increased in a marked degree. Good singing is dependent as much upon training as on natural gifts, as a vocalist who sings correctly and with taste will often afford more pleasure than another who has much greater compass and power of voice, but lacks cultivation.

There are three kinds of female voices—soprano, mezzo-soprano, and contralto; and three of male voices—bass, baritone, and tenor, for the usual range of which see article on MUSIC. A higher and uncommon class of male voices is known in England as alto or counter-tenor. The range and compass of voices among singers of all kinds are extremely variable, and it is not the compass alone, but the quality of notes in portions of the compass which determines the class under which a voice should be placed. In voices there are, numerically speaking, three qualities or registers—the chest voice (*voce di petto*), the middle voice, and the head voice (*voce di testa*). The chief distinction is, however, between the natural voice and the falsetto voice. To produce the notes of the former, the impulse should be made wholly from the chest, while the notes of the falsetto are given by directing the voice to the head. An accomplished singer is able to link the notes in the different registers without apparent effort, so as to completely disguise the effect of the break.

The best position in S. is standing. The singer should be at his ease, with his head erect and his chest well forward. The mouth should be sufficiently open to give a distinct pronunciation and a round quality of tone. The breath should be taken as silently as possible, and at judicious intervals, such as at the end of phrases or sections, after rests or staccatoed notes, and before long notes and cadences. To become a correct reader at sight it is necessary to be able to take all musical intervals with readiness and precision.

In exercising the voice the best method is to sing the notes of the diatonic and chromatic scales slowly, commencing and ending each note softly with a swell in the middle to the full power of the voice. This is known as the *Messa di Voce*. The graces of S., such as turns, shakes, and cadenzas, can only be accomplished with facility after assiduous practice. Expression depends on the power of modifying the voice through the gradations of *piano* and *forte*, and a correct application of accent, emphasis, &c. As a rule, ascending passages are sung with a gradual increase of tone and descending scales with a corresponding diminution; syncopated and tied notes require extra emphasis; slow movements are elegantly and softly sung, and rapid movements with spirit and brilliancy. Where a phrase or a note is repeated, a variety of expression should be introduced. Above all, the singer should feel what he sings, and his voice should faithfully express the emotions depicted in the words. Only thus will the language of his song touch the hearts of his hearers.

The *Vibrato*, or vibration of the voice, when judiciously applied, is often effective and pleasing, but its continual and indiscriminating use is a grave fault.

Bass and baritone parts are written in the F clef, the others usually in the C clef.

Sin'gular Success'or, in Scotch law, means one succeeding to real estate otherwise than as heir at law; as by purchase.

Sinigaglia or **Senigall'ia** (anciently *Sena Gallica*), a town of Italy, province of Ancona, at the mouth of the Misa, 18½ miles W.N.W. of Ancona by rail. It has ten churches, of which the best are the cathedral and the church of San Marino. S. was for centuries the scene of the greatest fair in Italy, which took place annually from 30th July till 8th August, but since 1869 has declined. It was the birthplace of Pius IX. and Angelica Catalini, the famous singer. Pop. (1877) 22,346, mostly engaged in the fisheries. S. was a city of the Senones, was colonised by Rome in 289 B.C., and made an episcopal see as early as the 4th c. Frequent devastations have left few traces of its antiquity. Near S. was fought the battle of the Metaurus, where Hasdrubal fell.

Sin'ister. See HERALDRY.

Sink'ing Fund, the name given to a fallacious scheme for the payment of the National Debt of Great Britain. At first (1716) it consisted in making certain taxes perpetual which had hitherto been imposed for a limited period, and creating a fund out of their surplus to reduce and ultimately to extinguish the debt. But the permanent taxation was as great a drain upon the resources of the nation as the S. F. was an accumulation of capital. The nation was in reality borrowing from itself to pay its debt, and was therefore practically doing the same thing as if it had incurred fresh debt of equal amount to that liquidated. Under the younger Pitt, the scheme of a S. F. attained much vaster dimensions. The loans raised to meet the requirements of the Exchequer were saddled with a surplus for this fund, and thereby the rates of interest were increased. A S. F., projected by Sir Stafford Northcote, was adopted by Parliament with 189 against 122 votes, in June 1875. Mr. Gladstone's objections to the scheme were held to be equally applicable to his own method of reducing the National Debt by terminable annuities.

Sino'pe (Turk. *Sinub*), a town in the vilayet of Kastamuni, Asia Minor, on the S. coast of the Black Sea. It stands on the isthmus of a small peninsula which terminates in a hill partly occupied by houses. It has an arsenal and shipbuilding-yard and extensive fortifications, completed in 1876. An old Byzantine castle, now used as a prison, stands on the S. side of the Turkish quarter. 'The Castle of Mithridates' is the only ancient building preserved. S. has trade in corn, fish, and timber, and forms a port of call for steamers between Constantinople and Trebizonde. Pop. 10,000. S. was at an early date colonised from Miletus. It became a great naval power, and aided the Ten Thousand on their return to Greece. Taken by Pharnaces in 183, it surrendered to Lucullus in 72, and was made a Roman colony in 45 B.C. Sultan Mohammed II. took it in 1461. On November 30, 1853, the Turkish fleet stationed here was destroyed by Russia. Diogenes (q. v.) and Mithridates the Great (q. v.) were natives of S.

Sin'ter, a word of German origin applied to the deposits or incrustations formed by the so-called 'petrifying springs.' They are all of comparatively recent origin. Common or calcareous S. consists of carbonate of lime deposited in various forms around a central nucleus, and often produced with such rapidity that perishable articles immersed in the water are entirely covered by it. Quartz S. or Silicon S. is a deposit occurring in the Geysers of Iceland and of the Yellowstone Region in America. Iron S. or pittacite is a product of the decomposition of iron pyrites, and often forms brown patches in old coal-mines.

Si'nus, a name applied to very varied structures and cavities in human and comparative anatomy. (1) Some of the most familiar sinuses are those spaces in the *frontal bone* known as the *frontal sinuses*. These form two cavities of irregular shape which extend upwards and outwards between the two layers or *tables* of the skull. They are absent in the child, but are developed with the full growth of the frontal bone. They are larger in men than in women, and communicate with the nose. The frontal sinuses in sheep often, and in man occasionally, form the abode of the larvæ of flies, which become a source of irritation and disease. A very large development of *frontal sinuses* is seen in the elephant, the air-cells of whose cranium serve to lighten the ponderous skull. (2) The term *S.* is also applied in anatomy to the channels or spaces of the skull through which venous blood flows. These channels are lined by the *dura mater*, an outer of the brain membranes, and num-

ber fifteen. They include a set of sinuses placed at the upper and back part of the skull, and a second series at the base of the cranium. Within these sinuses, the walls of which are thus formed of unyielding bone, a steady, uniform pressure of blood is secured, and the brain-structure is thus protected against the effects of variable blood-pressure.

Other sinuses of the body are found in the *heart*, the *kidney*, the *eye*, and the *penis*.

Sion (Ger. *Sitten*), capital of the canton of the Valais, Switzerland, at the confluence of the Sionne and Rhone, 62 miles E. of Lausanne by rail. Its chief buildings are the Gothic (partly Romanesque) cathedral, the Rathhaus, also Gothic, the fine church of St. Théodule, and the Castle of Valeria (on a hill 2054 feet high), now used as a seminary for priests, which contains the Church of St. Katharine, dating from the 9th c. On another hill 2165 feet high are the ruins of the Castle of Tourbillon, erected in 1294. A third episcopal castle, that of Majorca, is likewise a ruin. The town is defended by fortifications. Good wine and some silk are manufactured. Pop. (1870) 4898. S. was the *Sedunum* of the Romans, of whose presence traces still exist. The town suffered from a great fire in 1788.

Siout' or **Assiout'**, a well-built town of Upper Egypt, near the left bank of the Nile, 227 miles S. of Cairo by rail. It lies in a fertile district at the end of the Libyan Mountains. S. has fifteen mosques, a large palace surrounded by gardens, erected by Ibrahim Pasha, and as the terminus for caravans from Darfur, Nubia, &c., has a large trade. Its earthenware and saddlery are famed, and its bazaars rival those of Cairo. *El Hamar*, a small village on the river, serves as the port of S., with which it communicates by the *Yusuf* Canal. Pop. (1872) 27,470. S. occupies the site of the Græco-Egyptian town *Lycopolis* ('Wolf-town'), and mummies of wolves have been found here.

Sioux Indians. See INDIANS, AMERICAN.

Si'phon, in its most usual form, is a bent tube with one leg longer than the other. If it be filled with liquid and its shorter leg plunged into a filled vessel, the S. will draw liquid off until the surface of the liquid is brought down to the level of the shorter leg. To study its action, suppose two vessels placed side by side and filled with water to different levels. Fill the S., and plunge one leg into each vessel. If the level of the water were the same in both, there would be no flow, since the pressure is the same at each extremity of the S. But, because the levels are different, the pressure at the extremity of the S. which is immersed in the water at the higher level is greater than the pressure at the other extremity by an amount equal to the weight of a column of liquid, whose cross-section is equal to that of the bore of the S., and whose height is equal to the difference of level of the two masses of liquid. Consequently, there is a flow from the one vessel to the other until the levels are equalised The S. is employed in aqueducts, and in some of the drainage-works of the Bedford Level, but its chief use is in the racking of wines and liquors from off the lees.

Siphonostom'ata (Gr. 'siphon-mouths'), a term variously applied in zoology. 1. It is given to a division of Gasteropoda in which the mouth of the shell is perforated by a notch or groove for the passage of a *siphon* or respiratory tube. This type of shell is seen in the whelks, cowries, &c. 2. It is given to a group of lower *Crustacea* (also known as the *Ichthyophthira* or fish-lice) from the peculiar shape of the suctorial mouth.

Sipun'cle, the name given to the membranous tube perforating the septa or divisions of the shell in such *Tetrabranchiate* cephalopods as the Pearly Nautilus (q. v.), &c.

Sipun'culus, or **Spoon Worm**, a genus of lower *Annelida* or marine worms inhabiting the sand of British coasts, and frequently found within the cast-off shells of molluscs. The members of this group vary in length from half-an-inch to half-a-foot. *S. Bernhardus* is a familiar species. The S. has an anterior retractile proboscis. The digestive system is convoluted, and the anus or vent is anterior. The sexes are situated in distinct individuals, and the young undergo a metamorphosis. A species of S. (*S. edulis*) is eaten by the Chinese.

Sir (from Lat. *senior*, 'elder;' Fr. *sire*, *sieur*, *seigneur*), originally a translation of the Teutonic *elder* (preserved in *alderman*), is now either prefixed to the Christian name of a knight or baronet, or by itself is a respectful form of address corresponding to the Fr. *monsieur* or Ger. *mein herr*. Formerly it was also applied, like *dan* or *don* (q. v.), to bachelors of arts or the clergy generally, *e.g.*, 'Sir Hugh Evans.' In France, under the feudal system, *seigneur* was the title borne by the holder of a fief; and *sire*, since the 16th c., has been the exclusive appellation of royalty, as 'Sire, votre Majesté.' The plural 'sires,' however, is poetically used for ancestors.

Sir-Daria. See JAXARTES.

Si'ren, a musical instrument which affords a ready means for determining the number of pulses per second, and therefore the *pitch* of a given note. In its simplest form, it consists of a circular disc capable of rapid rotation round a central axis, and perforated by a concentric circle of holes equidistant from each other. If a stream of air be directed against the disc so as to pass through any one hole, and if the disc be then set in rotation, the current of air, let through and stopped in rapid alternation, will break up into a rapid succession of pulses. The faster the disc is made to rotate, the more quickly do the pulses follow one another the higher the pitch of the note. The rate of rotation is adjustable so as to make the S. note the same as any given note, and is then readily determined by a simple mechanical arrangement of screw and pinion which gives the number of revolutions of the disc per second. In Seebeck's S. there are several concentric circles of holes, each of which for a given rate of rotation produces a distinct note. A S. thus fulfils two purposes. It teaches what a musical note physically is, and supplies a convenient method for determining the pitch of any note. Cagniard-de-Latour, a French physicist, constructed a S. on an improved principle, which did away with the necessity of rotating the disc by mechanical means. His instrument consisted of two discs, pierced with exactly the same number of holes, and set close together, so that the holes faced each other. The one disc was fixed, the other capable of rotation. The holes, however, were bored obliquely through the discs in such a way that when the discs were in position any two corresponding holes met at an angle. A current of air traversing a hole in the stationary disc struck the side of the corresponding hole in the movable disc, and was then deflected through the hole, forcing the disc on at the same time. In other words, the blast of air which, by its interruption, was to give rise to the note, at the same time impelled the disc onward, thus itself providing the conditions for the production of the necessary discontinuity. The characteristic peculiarity of Helmholtz's S. is that there are in reality two sirens attached to the same axis. These are constructed on Cagniard-de-Latour's principle, and each is capable of sounding four distinct notes, being perforated in four concentric circles. By a simple mechanical arrangement, any one or any combination of two or more of these possible eight notes can be sounded at pleasure, and the notes are so related numerically that the ordinary major and minor triads can be produced. See Helmholtz's *Tonempfindungen* (1862, 3d ed. 1870; English translation by Ellis, 1875).

Si'ren, a genus of Amphibian vertebrata forming the type of the family *Sirenidæ*, of which the *S. lacertina* or mud-eel of American rice swamps is the most familiar example. The gills of early life persist as in *Proteus*, &c.; the hinder legs are wanting, and the front legs, which are weak, have four toes. The tail is long, slender, and compressed. The average length is about 3 feet. Lungs are developed in addition to the persistent gills. The food of the S. is worms and insects.

Sire'nia, an order of *Mammalia* (q. v.) including but two existing genera—the Manatees (q. v.) and Dugongs (q. v.). Another Sirenian, the *Rhytina*, was discovered by Behring, but became extinct in 1768.

Si'rens (Gr. *seirēnes*, 'ensnarers' or 'entanglers,' from *seira*, 'a rope'), in Greek mythology, were maidens like the Lorelei of Northern folklore, who by their enchanting strains lured mariners to their destruction. Ulysses, stuffing his comrades' ears with wax and binding himself to the mast, escaped their wiles; and in the Argonautic Expedition Orpheus so vanquished them in melody that for very shame they cast themselves into the sea, and were turned into rocks.

Sirhind', an extensive tract in N.W. India, forming the watershed between the basins of the Sutlej and Jumna rivers.

Area, about 17,000 sq. miles. It is now divided among several administrative districts of the Punjaub and a few native states, but formerly was a unit of political and geographical importance. It was the original cradle of the Sikh religion, and here the great town of S., now in ruins, was reduced to its present condition in 1709 by Sikh fanatics, in revenge for outrages there perpetrated on one of their *gooroos*. In 1809 the British established their supremacy, and Runjeet Singh was confined to the left bank of the Sutlej. The chief towns are Loodiana, Umballa, and Ferozpore; the principal native state is Puttiala.

The S. Canal is a project, now in course of execution, for irrigating this sandy tract and opening a navigable communication between the Sutlej at Ferozpore and the W. Jumna Canal above Kurnul. The proposed length is 554 miles, which will irrigate 783,000 acres. The estimated cost is three millions sterling, of which one million will be paid by the native states benefited. Convict labour is being largely used on the work.

Sir'ikul, a lake of Central Asia, on the Pamir plateau, at an elevation of 15,600 feet, whence rises the N. arm of the Amu-Daria. The direct road E. to Kashgar is a difficult track along its shore.—**S.** is also the name of a district on the E. side of the plateau (11,000 feet high), which was an independent state till annexed by Kashgar in 1868. The chief city is Tashkurgan (anc. *Lithinum pyrgum*), formerly a place of note on the route to China.

Sir'ius, or **The Dog Star**, the brightest star in the heavens, situated in Canis Major, a constellation of the southern hemisphere. As seen in middle latitudes in the northern hemisphere it lies low on the southern horizon below Orion, and is therefore visible during the winter months. Through a good telescope it is seen to have a companion, which some regard as really a planet.

Sir'loin (Fr. *sur*, 'over,' and loin), a loin of beef. Tradition reports that the name originated through Charles II., after dining off a loin of beef, playfully knighting it—

'He held his sword pleased o'er the meat,
"Rise up, thou famed *Sir-loin*."'

A double S. is called a Baron of Beef (q. v.).

Siroc'co. See SIMOOM.

Sir'sa, the chief town of the district of the same name in the Punjaub, British India, 149 miles N.W. of Delhi. The modern town was founded in 1837, near a ruined site. There is some trade in grain, sugar, and salt. Pop. (1868) 11,000.—The *district* of S., which is bounded W. by the Sutlej and traversed by the Ghuggur, has an area of 3121 sq. miles. Pop. (1868) 210,795. It is much overgrown by jungle. The breed of cattle is famous; at the fair at S. town 150,000 are sold annually.

Sismon'di, Jean Charles Léonard Simonde de, 'the great liberal historian,' was born of an old Pisan family at Geneva, May 9, 1773. After a course of study in the college of his native town he entered a counting-house at Lyon, which he left in 1793 to accompany his family to England. He returned to Geneva in 1795, next lived some years at Peschia in Tuscany, and settled finally at Geneva in 1800. In 1803 he published here his first work, *Traité de la Richesse Commerciale*, an exposition of the economic principles of Adam Smith, which, however, he afterwards abandoned in his *Nouveaux Principes d'Économie Politique* (2 vols. Par. 1819), and his *Études des Sciences sociales* (3 vols. Par. 1836–38). In 1813 he visited Paris for the first time, and in 1814 contributed a series of articles to the *Moniteur*, which were published in a volume under the title *Examen de la Constitution Française* (Par. 1815). This work procured him the honour of an interview with Napoleon. He now returned to Geneva, where he continued to prosecute historical studies till his death, June 25, 1842. His principal works (besides those named) were *Histoire des Républiques Italiennes du Moyen Age* (16 vols. Zur. and Par. 1807–18); *De la Littérature du Midi de l'Europe* (4 vols. Par. 1813–29, English translation by T. Roscoe, 1823); *Histoire des Français* (31 vols., the 30th written by Amedée Renée, the first being the general index, Par. 1821–44); *Julia Severa, ou l'An 492* (3 vols. Par. 1822); *Revue des Progrès des Opinions Religieuses* (Par. 1826); *Histoire de la Renaissance de la Liberté en Italie, de ses Progrès et de sa Chute* (2 vols. Par. 1832); *Études sur les Constitutions des Peuples Libres* (Par. 1836); *Précis de l'Histoire des Français* (2 vols. Par. 1839); besides many articles in the *Bibliothèque Universelle, Atti della Accad. Italiana, Revue Encyclopédique*, and Lardner's *Cyclopædia*. See the collections of his correspondence with Mlle. de Sainte-Aulaire (Par. 1863); *Lettres inédites à Mme. d'Albany* (Par. 1864); and *Vie et Travaux de S.* (Par. 1845).

Sis'ters of Char'ity. See BROTHERS AND SISTERS OF CHARITY.

Sis'tova, a town of Bulgaria, on the Danube, opposite Simnitza, 38 miles S.W. of Rustchuk, beautifully situated on undulating slopes. It has 19 mosques and 5 churches, and carries on manufactures of wine, leather, and wool. Pop. 12,000. Here was signed, on 4th August 1791, a treaty of peace between Turkey and Austria. S. was a place of some importance in the Russo-Turkish war. Part of the Russian army crossed the Danube here, and the town fell into their hands on 27th June 1877.

Sis'yphus, a mythical king of Corinth, son of Æolus and Enarete, and husband of Merope, who for his wickedness on earth was doomed in Hades to roll up a hill a huge block of marble, which as soon as it reached the top fell straightway down again, making his toil endless.

Sítápur ('the town of the goddess Sita'), the chief town of the district of the same name, in the province of Oude, British India, 105 miles S.E. of Bareilly and 51 N.W. of Lucknow. Pop. (1869) 5780. It was formerly the site of an important military cantonment, and the headquarters of the Khyrabad Division. In June 1857, the three battalions of native infantry and Oude Irregulars mutinied. Most of the European residents, civil and military, were immediately killed, a few escaped for the time, two women and one child alone survived, to be ultimately rescued from their prison in the Kaiserbagh at Lucknow, in March 1858.—The *district* of S. lies between the Bapti and Gumti rivers. Area 2250 sq. miles; pop. (1869) 930,224.

Sit'ka, or **Baranof'**, the chief island of the King George III. or S. Archipelago, on the W. coast of N. America, politically a part of Alaska, and belonging to the United States. The surface is rocky, and covered with pine forests. Area, 1567 sq. miles.—**S.** or **New Archangel**, on S. island, is the capital of Alaska, and is garrisoned by 180 United States troops. It has a few small public buildings, a magnetic observatory, a hospital, arsenal, &c. Several San Francisco merchants have established warehouses here. The harbour is excellent, and there is some trade in fish and peltry. Pop. 1200.

Sitt'a. See NUTHATCH.

Siva (pronounced Shĭvă, or in Bengal Sheeb, from a Sanskrit word meaning happy), the god of destruction, and the most popular of the Hindu trinity. His emblem is the *Linga* (q. v.) or *phallus*; and he is represented with every horrible sign of human bloodshed, and frequently accompanied by his bull Nundy. His wife is Kali (q. v.) or Durgah. Other names by which he is worshipped are Mahadeva, 'the great god,' and Iswara, 'lord.' His worship is unknown in the earliest period of the Vedas, and is chiefly developed by the later Puranas; at present it is undoubtedly predominant over the milder worship of Vishnu. Though plausibly conjectured to have been borrowed either from the aboriginal tribes or the Dravidian race, it has been especially adopted by the Brahmins as opposed to the cultivated laity. According to the Madras census of 1871, 16,159,000 persons in that presidency, or 50 per cent. of the total population, are Sivaites.

Sivathe'rium, an extinct genus of *Ruminant* quadrupeds, allied to the existing Giraffe (q. v.). S. remains occur in Miocene strata in N. India. Some authorities regard the S. as having been most nearly related to the antelope. Like the four-horned Indian antelope it had four horns, two small, and two large and palmate. The neck was long, and the face short. An allied fossil form is *Helladotherium*, the remains of which occur in Tertiary strata in France and Greece.

Sivaji', the founder of the Mahratta power in India, and the boldest warrior the Hindus have ever produced, though, like Hyder Ali and Runjeet Singh, he could neither read

nor write. He was born of Rajput descent at the hill fort of Sewneri in 1627, and was brought up at Poonah, which belonged to his father, who had also feudal estates in the Carnatic. At the age of nineteen he began his career by seizing the neighbouring strongholds, and by attacks upon the Mohammedan kingdoms of Bijapur and Delhi. In 1659 he treacherously assassinated with his own hand the Bijapur general, and established his power over the whole Mahratta country. He twice sacked Surat, and fitted out a fleet to intercept the pilgrims to Mecca. In 1664 he assumed the title of Rajah and established a mint, but shortly afterwards joined the imperial army, and even appeared at the court of Aurungzib at Delhi. In 1674 he was solemnly enthroned at Raighur, which he had lately stormed. On this occasion he was weighed against gold, and the sum (about 10 stone or 16,000 *pagodas* in value) was distributed among Brahmins. At this time the British at Bombay made a treaty with him. The whole of the Deccan was now tributary, and he led a marauding expedition as far S. as Tanjore. S. died at Raighur in 1680. None of his children showed any ability, but his descendants ruled in the diminished State of Sattara (q. v.), latterly under English protection, until 1848. The present Raja of Kolhapur is also a lineal descendant, and the Princess of Tanjore is descended from a half-brother. In ridicule of his birthplace and of the characteristics of the Mahrattas, he was styled by Aurungzib 'the mountain rat;' but the Mogul dynasty never recovered from the shock which he gave to it. S. was a bigoted Hindu, and had consecrated himself and his sword to the goddess Bhowani, one of the appellations of Kali, the destroying wife of Siva. See *The History of the Mahrattas*, by Colonel Grant Duff (Lond. 1826).

Si'vas (anc. *Sebasteia*), capital of the vilayet of S. and of Armenia Minor in Asiatic Turkey, at the head of the Kizil-Irmak valley, 400 miles E. of Scutari. It is on the line of the proposed Euphrates Valley Railway. In the centre of the town rises a ruined citadel. There is a bazaar, a prison, barracks, one fine mosque, and many smaller ones. Two miles off is the Armenian monastery of Nishan, or the Cross, with conspicuous Gothic towers, 500 years old. S. is a most important military position, as it commands the only entrance to the tableland of Asia Minor, but the Turks have neglected to fortify it. Tobacco is the staple product, but the surrounding district being very fertile, sugar, beetroot, and sweet carrot could be raised in great quantities. There is abundant waterpower, and coal is found. The climate is healthy for Europeans. Pop. 28,000, partly Christian and partly Mohammedan. Originally *Sebasteia*, it was enlarged and called *Megalopolis* by Pompey, and was an important place under the Roman and Byzantine empires.

Sivash', or **Gniloe-More** (Russ. 'Foul Sea'), a large shallow lake in the N.E. of the Crimea (q. v.), 92 miles long, 2 to 12 broad, and 916 sq. miles in area. It is bounded on the E. by the long narrow Tongue of Arabat, 2 feet high, and communicates with the sea by the Genitchesk or Tonko Strait, little above 100 yards wide. S. is marshy, overgrown with sedge, and peopled by waterfowl.

Six'tus, the name of five popes.—**St. S. I.**, Bishop of Rome from 119, was beheaded by Hadrian, 6th August 128.—**St. S. II.**, born at Athens about 180, pope from August 24, 257, suffered martyrdom at the hands of Valerian, 6th August 258.—**St. S. III.**, born at Rome, was pope from July 31, 432. He sent St. Patrick as a missionary to Ireland, and to him Augustine addressed his celebrated letter on grace. He died at Rome, August 18, 440.—**S. IV.** (Francesco della Rovere), born 22d July 1414, pope from August 9, 1471, equipped a fleet against the Turks, which had small success. He is accused of complicity in the Pazzi conspiracy against the Medici, in which his nephew, Cardinal Riario, bore an active part. The Florentines discovering the plot, S. excommunicated them, ostensibly on the ground that they had hanged an archbishop. In 1482 he leagued with Venice to deprive Duke Ercole d'Este of the city of Ferrara. Naples and Florence opposing this, and the Emperor threatening to call a general council, S. suddenly made peace, and excommunicated the Venetians for not following his example. S. has the credit of effecting certain reforms of the religious orders, but his reign was marred by intrigue, nepotism, and extravagance. He built the Sistine Chapel of the Vatican, and founded (1474) the festival of the Conception of the Virgin. He died at Rome, August 13, 1484.—**S. V.** (Felice Peretti), born of poor parents, 13th December 1521, at the village of Grotteamare, in the March of Ancona, entered the Franciscan order in 1534, and was successively professor of canon law at Rimini (1544), of theology at Siena, vicar-general of his order (1566), bishop and cardinal (1570). Under Gregory XIII. he lived the most retired life, and according to the chroniclers cultivated an appearance of premature senility, which contributed to his election to the pontificate, April 24, 1585. No sooner had he become Pope, however, than he instituted rigorous measures of reform, clearing his territory of robbers with such merciless severity that the name of 'Papa Sisto' is proverbial in Rome to the present day. He drained the Pontine marshes, established linen and silk manufactures, and erected many buildings within the city, among these the basilica of St. Peter and the library buildings of the Vatican. He carried out many reforms also in the administration of the Church, fixed the number of cardinals at seventy, and purified the discipline of the religious orders. He was liberal to scholars, and new editions of the Vulgate and Septuagint are connected with his name. The main object of his foreign policy was to check the ambition of Philip II. of Spain, and promote the influence of the Church. He excommunicated Elizabeth of England, and lent his aid to coerce the Huguenots in France and the Lutherans in Germany, but vigorously opposed the severities of the Spanish Inquisition. S. died August 17, 1590, leaving a reputation against which his numerous enemies could bring no charge save that of severity, but at the same time so unpopular that his statue was immediately broken by the Roman populace. See Tempeste, *Storia della Vita e Gesti di Sisto V.* (2 vols. Rome, 1754); J. Lorenz, *S. V. und seine Zeit* (Mainz 1852); and Segretain, *S. V. et Henri IV.* (Par. 1861).

Size, a kind of weak glue or adhesive varnish used in many industrial pursuits. House-painters' S. is prepared from shreds of leather, boiled and strained; papermakers use two kinds, one made from hide-cuttings, alum, and soap, and a second of rosin and potash; and the S. employed in gilding, japanning, &c., is variously composed of linseed-oil, copal, red lead, litharge, vermilion, &c., with turpentine. See GELATINE.

Sjæll'and (Eng. *Seeland*), the largest of the Danish islands lying between the Cattegat and the Baltic. It is separated from Sweden by the Sound, and from the island of Fünen by the Great Belt. Its length from N. to S. is 80 miles, and its greatest breadth from E. to W. 67 miles. The area of S., together with the small islands Möen and Samsö, is 2793 sq. miles, and pop. (1875) 671,400. The coast is deeply indented in the N. by the Isefjord and the Roskildefjord, and has on the E. the Kjöge Bucht and Faxö Bucht. The surface is flat, or sloping gently to hills, nowhere exceeding 400 feet in height. Many lakes dot the surface, and find an outlet by numerous streams. Large tracts are covered with beech and oak forests, and corn is abundantly raised for export. On the E. coast is situated Copenhagen, from which railways radiate through S. to Elsinore in the N., and Korsör in the S.W. of the island.

Ska'gen, or the **Skaw** ('the promontory' or 'isthmus'), the most northerly point of Jutland, Denmark. Near it is a village of 1615 inhabitants, and on the point stands a stone lighthouse 72 feet high.

Ska'ger-Rack, or (Dan.) **Skagerak** ('the strait of the promontory'), an arm of the North Sea, between Norway and the Danish peninsula of Jutland, connecting the North Sea with the Cattegat (q. v.). Its breadth varies from 70 to 90 miles, its length is 140 miles. The current usually sets E. along the coast of Jutland, where there are no harbours and the depth is 30 to 40 fathoms, and W. along the Norwegian coast, where the depth is 200 fathoms and good harbours are numerous.

Skald (Icel. *skáld*, O. H. Ger. *scellan*, 'to sound'), a reciter and singer of heroic poems and eulogies among the Norsemen. Specimens of their poems are found in the younger Edda (q. v.), in the Sagas (q. v.), and in the Heimskringla.

Skate (*Raia*), a genus of *Elasmobranchiate* fishes, belonging to the section *Batides*, in which the body is greatly broadened owing to the large size of the breast fins, which are united to the body. The mouth and gill-openings are on the under surface.

The eyes and *spiracles*, the latter, openings for admitting water to the gills, are on the top of the head. The tail is long and slender. It is *heterocercal*, and is often armed with formidable spines. The teeth are usually flat, and form a pavement-like arrangement in the mouth. The common Thornbank S. (*Raia clavata*) is a notable species, deriving its name from the spines which are borne on the upper surface of the tail. Skates are largely captured for food, the flesh being palatable and easily digested. The common S. is the *Raia batis*, often named the blue and grey S. Other species are the long-nosed S. (*R. mucronata*) and the sharp-nosed S. (*R. oxyrhynchus*), often named in Scotland the white S.

Skates (Dutch, *schaat*) and **Skating**. Skates are contrivances which, when fastened to the boots, enable a person to move rapidly over ice. They consist of a steel runner or ridge fixed either to a wooden sole provided with straps and buckles, or to a light iron framework having adjustable clamps, or other means of attachment to the boots. Skates with iron ribs were brought to England from the Netherlands about 1650. Pepys has noted in his *Diary* that he witnessed the 'very pretty art' of skating in 1662, the year of the great frost. Before the introduction of these skates, English people amused themselves on the ice by tying pieces of bone to their shoes, and urging themselves forward by means of a spiked staff. Skating is a most agreeable, healthy, and invigorating exercise, and with courage and confidence the first steps of the art are easily acquired. Figure-skating has been carried to great perfection by both sexes in Europe and America, and the skill and gracefulness displayed in it fairly entitle it to rank as a fine art. In Holland nearly every person is proficient in skating, and winter travelling is usually performed by means of it. The manner of skating called 'Dutch-roll'—a series of parallel sinuous curves executed on both feet—is commonly practised in that country. The inhabitants of the fen counties of England have also great repute for dexterity in skating, and it is recorded that one fen 'champion' attained a speed of one mile in two minutes.

Roller-skating, re-introduced some years ago from America, was until lately a very fashionable pastime in Great Britain. The skates used in it are provided with little wheels instead of iron ribs. The skating-ground, called a 'rink,' is commonly constructed of asphalt or concrete, or formed of artificial ice, so that the amusement may be enjoyed at all seasons, unlike skating on natural ice. Roller or 'parlour' skates were first patented by one Petitbled in France in 1819. Four years later, R. J. Tyers of London patented his 'volitos,' as he termed them, which had five little wheels in single line. Roller-skating did not then take the public fancy. About forty years later, when the pastime had become an American 'institution,' attempts to introduce it into England met with more success, and it gradually rose in popularity. Mr. J. L. Plimpton's roller-skates, patented in America in 1863, and two years later in England, are now in very general use. They have two pairs of rollers or runners, which are so attached to the footstand that by tilting it the axes of the rollers converge, enabling curves to be described with the greatest facility. With roller-skates skilful performers may dance and execute all the elegant evolutions of ice-skating.

Skeat, Rev. Walter William, born in London, 21st November 1835, proceeded in 1854 from King's College School, London, to Christ's College, Cambridge, graduated B.A. as fourteenth wrangler in 1858, and obtained a college fellowship in 1860. S. now took orders, and after three years of parochial duty, became mathematical lecturer at Christ's College (1864-67), and English lecturer (1867-76). Appointed Director of the 'English Dialect Society' on its establishment in 1873, he has been one of its most laborious and successful editors. In 1878 he was unanimously elected to the newly-founded Elrington and Bosworth Professorship of 'Anglo-Saxon' in the University of Cambridge. S. is perhaps the most admirable editor of Early English literature that has ever lived. Familiar with all its contents, and more profoundly skilled than any of his contemporaries in the difficult lore of MSS., he also brings to the elucidation of his texts a keenly penetrative yet sympathetic criticism that overlooks nothing and weighs everything. Some of his editorial labour, *e.g.*, *Piers the Plowman* and his Essay on the 'Rowley Poems' of Chatterton, is as masterly as anything ever achieved in regard to a Greek or Roman classic. Among his most important works are his *Mœso-Gothic Glossary* (printed by the Philological Society 1868), and *The Gospels of St. Mark and St. Luke in Anglo-Saxon and Northumbrian Versions* (2 vols. Camb. Univ. Press, 1875); for the 'English Text Society' his editions of *Launcelot of the Laik: a Scotch Metrical Romance* (1865); *Parallel Extracts from Twenty-Nine MSS. of Piers the Plowman* (1866); *The Vision of William concerning Piers the Plowman* (parts i.-iv. 1867-77); *Pierce the Ploughman's Crede* (1867); *The Lay of Havelok the Dane* (1868); *The Bruce; by Master John Barbour* (1-2, 1870-); *Joseph of Arimathie; or the Romance of the Seint Graal, or Holy Grail; with other Lives of Joseph of Arimathea* (1871); Chaucer's *Treatise on the Astrolabe*; for the Clarendon Press he has edited one vol. of *Piers the Plowman* (1869); the 2d vol. of *Specimens of English Literature* (1871), and 2 vols. (1874-77) of Chaucer's *Canterbury Tales*; and has edited Ray's *Collection of English Words and Seven other Glossaries* (1875) (for the 'English Dialect Society),' and Shakespeare's *Plutarch* (vol. i. 1875).

Skel'eton (Gr. *skeletos*, 'dried up'), the name given generally to the hard parts of both Invertebrate and Vertebrate animals. In comparative anatomy the *exoskeleton* denotes such parts as the teeth, scales, &c., which are formed from the skin or *dermal layer*, while the *endoskeleton* denotes the internal S. found in *Vertebrate* animals alone, and which serves to support the various tissues of the body, as well as to form cavities (*e.g.*, skull and thorax) for the protection of organs. As examples of the exoskeleton of *Invertebrata*, the 'shell' of the lobster, sea-urchin, or whelk, may be selected. In vertebrates, the scales of the Armadillo or Pangolin, of fishes and reptiles, the feathers of birds, and the teeth at large may be taken as representing an outer S. There are two skin layers—an outer, the *ecteron*, and an inner, the *enderon* or *dermis*. The ecteron or *epidermal* structures never form bony masses; they may, however, be horny, as is seen in the tortoiseshell plates of turtles, or in the *callosities* of horses and monkeys. The *dermis* or *enderon* frequently, on the other hand, becomes ossified, as is seen in the bony armour of the armadillos over which an epidermal horny layer is placed. In the crocodiles and turtles there is a similar arrangement of dermal and epidermal coverings.

The *internal S.* or *endoskeleton* of vertebrates varies exceedingly in its structure, form, and composition. In the *Amphioxus* or *Lancelet*, at once the lowest fish and vertebrate, the *endoskeleton* is represented by a single cellular body, the *notochord* or *chorda dorsalis*, which extends, as it does in no other vertebrate, quite to the interior extremity of the body. This notochord appears as the early representative of the spine in all other vertebrates. The *vertebral column* or *spine* forms the foundation of the entire endoskeleton, and usually consists of definite segments or *vertebræ*, which are *homologous* throughout. Professor Owen's idea of the composition of a vertebrate S. is that it consists essentially of a series of modified *vertebræ*, the limbs and their girdles being extraneous parts or appendages of the vertebræ of these several parts. Other anatomists have sought to show that the skull is not developed after the fashion of vertebræ, but owes its origin to a different mode of formation. In Owen's view there is much that is consistent and remarkable as applied to the homology of the spinal elements; his researches serving to supply a connected view of the modifications of the spine perceptible throughout the vertebrate series. Regarding the spinal column as made up of a series of homologous or like parts, what is the composition of the *ideal* or *typical vertebræ?* It consists (1) of a body or *centrum*, (2) of two upper arches (*neural arches*, or *neurapophyses*), which spring superiorly from the centrum and inclose the spinal cord; (3) of a *neural spine* formed by the coalescence of the neural arches; (4) of two inferior arches (*hæmapophyses*, or *hæmal arches*), inclosing the main parts of the circulatory or hæmal system; (5) of a *hæmal* or *inferior spinous process* formed by the junction of the hæmal arches. To these essential parts other elements are added, consisting of *processes* for articulation with neighbouring vertebræ, and of *processes* for the attachment of muscles. The *typical vertebral segment* is thus seen to consist of two arches, inclosing the nervous and circulatory centres respectively and appendages. In man, a typical vertebra includes not the spine alone, but the ribs and sternum; the latter forming the hæmal arch, including the heart or circulating organs. In the tail vertebræ of the crocodile, on the contrary, the typical parts are well seen.

The study of the comparative anatomy of the S. shows us that

the human S. belongs to a much-modified type of structure, and that for the due understanding of the homologies and relationship of skeletal parts we must study the S. of some lower form (*e.g.*, crocodile), in which most of the parts typical of a vertebrate S. are well represented. The various regions of the human S., and general descriptions of that of lower animals, are described in special articles.

Skell'igs (Ir. Gael. *sceilig*, 'a rock'), three islets, 6 miles W.S.W. of Bolus Head, County Kerry, Ireland, named Great S., Little S., and Lemon Rock. On Great S. are ruins of an abbey, and a light visible 25 miles off.

Skel'ton, John, born in Norfolk of Cumbrian ancestry about 1460, appears from entries in the Treasury Books to have been an under-clerk in the Exchequer (1472-73). He graduated M.A. of Cambridge (1480), having also it seems studied at Oxford, since by that university he was created poet-laureate (1490), as by the former (1493). In 1498, being then tutor to the Duke of York (afterwards Henry VIII.), he took holy orders; as rector of Diss in Norfolk (1504-15) he played the unholiest pranks, at least if the *Merie Tales* speak anything true. When Wolsey's patronage of him began, or why it ceased, we know not, only that in one poem S. extols the Cardinal's 'noblenes,' in another loads him with every epithet of abuse. Forced to take sanctuary at Westminster from Wolsey's vengeance, he met a kindly welcome from Abbot Islip, and there abode till his death, 21st June 1529. S.'s chief satires—and satire was his forte—are *The Bowge* (reward) *of Courte*, in 7-lined stanzas, and in the short-lined metre known by his name, *Colyn Clout* and *Why come ye not to Courte?* one an attack on the clergy generally, the other on Wolsey in particular. His *Tunnyng* (brewing) *of Elynour Rummyng*, sketching an ale-wife and her gossips with equal wit and coarseness, presents a singular contrast to *Phyllyp Sparrowe*, where a Norwich nun mourns, like the 'Lesbia' of Catullus' poem, over her pet, 'whom Gyb our cat hath slayne'—a dainty theme handled with rare and delicate fancy. The *Garlande of Laurell*, like most self-adulations lengthy and dull, completes, with thirty-three other English, one French, and nineteen Latin poems, his extant pieces, of which the lines *Of the Death of Edwarde the Fourth* (1483) was probably his earliest essay, as his *Magnyfycence* is one of our oldest and finest interludes. See the introduction to Dyce's edition of S.'s works (2 vols. Lond. 1843).

Skene, James, a scion of an ancient Aberdeenshire family, was born at Rubislaw, 5th March 1775, spent several years of his youth in Saxony, where he acquired a perfect knowledge of German. On his return to his native country, he formed a close friendship with Sir Walter Scott, who dedicated to him the fourth canto of *Marmion*. In 1806 he married Jane, daughter of Sir William Forbes of Pitsligo, by whom he had three sons and four daughters. He died 27th November 1861. S. was a man of fine character, cultivated tastes, and lively talents. Scott owed him not a little in various ways. Some of the Jewish scenes in *Ivanhoe* were suggested by S., who also furnished the great novelist with part of his materials for *Quentin Durward*. His archæological tastes he transmitted to his second son, **William Forbes S.**, born at Inverie, Kincardineshire, 7th June, 1809, educated at the High School of Edinburgh, studied in Germany and at the Universities of St. Andrews and Edinburgh. In 1831 he became a Writer to the Signet, a profession which he still (1878) follows. For upwards of forty years S. has devoted his leisure to laborious researches in the most remote, obscure, and difficult parts of the national history. His first important contribution to literature was *The Highlanders of Scotland, their Origin, History, and Antiquities* (2 vols. 1837). Since then, besides numerous papers of the highest critical value, read before the Royal Society of Edinburgh and the Society of Antiquaries, Edinburgh, he has edited *The Dean of Lismore's Book, with Introductions and Notes* (1861), *Ancient Gaelic Poetry, Chronicles of the Picts and Scots, and other Early Memorials of Scottish History* (1867), Fordun's *Cronica Gentis Scotorum* (2 vols. 1871) in the 'Historians of Scotland,' and has published two original works, *The Four Ancient Books of Wales* (2 vols. Edin. 1868), and *Celtic Scotland, a History of Ancient Alban* (2 vols. Edin. 1876-77), which have given him a foremost place, not merely among Scottish, but European archæologists. Nothing in the least comparable to S.'s work has been done by any earlier Scottish scholar. In thoroughness of investigation, solidity of knowledge, critical insight, and reconstructive power, he is far above the best of his contemporaries, and may safely be pronounced the greatest archæologist that Scotland has yet produced.

Skerr'ies (Ir. Gael. *sceire*, 'sea-rocks'), the name of various bare rocky islets off the British coasts. The chief are (1) the Pentland S., on the E. entrance to the Pentland Firth (q. v.); (2) the S. off the coast of County Dublin (q. v.), Ireland. The S. railway station is 17¾ miles N. of Dublin; (3) the S. or Isle of Seals, a rocky islet off Carmel Point, Anglesea, England, with a lighthouse; (4) Skerryvore (q. v.).

Skerryvore' Light'house, a lighthouse built on a rock forming one of an extensive reef lying about 12 miles S.W. from the wild Isle of Tyree on the W. coast of Scotland. Lying in the fairway of vessels making for the Clyde and Mersey, it was long the terror of mariners. The reef is exposed to the mighty 'fetch' of the Atlantic. The rock on which the tower is built is composed of gneiss worn so smooth by the continued action of the sea that the foreman mason compared landing on it to climbing up the neck of a bottle. In order that the light might show far beyond the foul ground, the tower was designed so that it might have a range of 18 nautical miles. The tower is 137 feet 11 inches in height, 42 feet in diameter at base, decreasing to 16 feet at the top, and contains a mass of granite masonry of 58,580 cubic feet. For 26 feet in height the tower is solid, and the contents weigh nearly 2000 tons. The walls, as they spring from the solid, are 9½ feet thick, gradually diminishing to 2 feet at the top. Above the solid the interior is 12 feet in diameter, divided into nine storeys, surmounted by a lightroom and lantern. Operations were commenced on the rock in 1838, and the light was exhibited in February 1844, six years being thus occupied in the work. The apparatus is dioptric revolving, the light attaining its greatest brilliance once a minute; the machinery which drives the apparatus is also employed to toll fog-bells. The tower is the tallest and most graceful rock lighthouse in Britain, if not in the world. The cost of the work, including the steam-vessel, the small harbour for the attending vessel, and the dwellings for the keepers and seamen, was £86,977. The lighthouse, which was designed and erected by the late Mr. Alan Stevenson, is a noble monument of his engineering skill.

Skew, a stone built into the bottom of a gable, to form an abutment and support for the coping above: an oblique arch.

Skew-Bridge, a bridge whose arch is skewed or oblique, its plan being rhomboidal, not rectangular. Skew-bridges are of frequent occurrence on railroad tracks, which, by their use, are carried across roads, rivers, &c., at an oblique angle, thereby avoiding the awkward turns that would sometimes be necessary in striking the roads at right angles.

Skibbereen' (Ir. Gael. *Scibirin*, 'the place of the *scibs*' (Eng. 'skiffs') or 'boats'), a market-town of County Cork, Ireland, 34 miles W.S.W. of Bandon by rail, on the Ilen, which is navigable for vessels of 200 tons up to Aldcourt, 2 miles below S. The chief buildings are a Catholic and a Protestant church, a new townhall, market-house, hospital, &c. There entered, in 1877, 337 vessels of 23,347 tons, and cleared 152 of 13,095 tons, while on December 31 of that year 21 vessels were registered as belonging to the port, besides 433 fishing-boats employing 1834 hands. The imports amounted (1877) to £20,465, and the customs to £313. Pop. (1871) 3695, of whom 3209 were Catholics.

Skid, in army, a slab of iron or timber placed below a gun or other object to keep it off the ground. On board ship a beam used as a support for a heavy body is known by the same name. Timbers laid across a ship to support the larger boats are called S.-beams.

Skidd'aw, a mountain in Cumberland, 3058 feet high, lies to the right of the road from Derwentwater to Bassenthwaite, and may be easily ascended from Keswick, 6 miles distant.

Skin, the name given generally to the outer layer or investment of animal bodies, consisting typically of two layers, the

ecteron or *epidermis*, and the *enderon* or *dermis*. The former is devoid of nerves and bloodvessels; the latter is sensitive, and plentifully provided with vessels. At the tips and other orifices of the body, the outer layer is modified to form the more delicate *epithelium*, which is continued inwards to form the lining of the alimentary canal and the other passages of the body. As mentioned in the article SKELETON, the *ecteron* may secrete hard parts (*e.g.*, nails and hair); and the *enderon* may also form hard structures, represented by the teeth. The outer layer of the skin or *epidermis* consists of flattened *epithelial* cells, often named *pavement* or *tesselated* epithelium. The deeper cells are long in shape, the superficial cells flattened and scale-like. The epidermal cells often contain pigment; its *rete mucosum*, or deeper layer, being that wherein pigment is typically developed. The sensitive *dermis*, *corium*, or *cutis vera*, consists of *fibro-cellular* tissue, exhibiting numerous spaces or *areolæ*. It rests in turn upon *cellular* and *adipose* tissue. The surface of the *dermis* is elevated into numerous *Papillæ* (q. v.), these structures being the organs of touch. The *papillæ* vary in form. They may be *simple*, or may have their extremities divided, as seen in the palm of the hand, where they are disposed in double rows and in parallel curved lines. The average length of papillæ is about the $\frac{1}{100}$th inch, and their diameter at the base about $\frac{1}{250}$th inch. To each papilla a capillary loop supplies blood, a nerve-fibre affording the means for exercising sensation. Nerve-fibres terminate in papillæ in so-called *touch-capsules*, bodies of oval shape, and *end bulbs*; the latter, according to Krause, being little oval-shaped bodies having a diameter of $\frac{1}{600}$th inch. The papillæ are invested by the non-sensitive epidermis, so that the sense of touch is exercised through the upper layer of the S.

The S. has certain very important *glands*, which enable it to perform a large share of the work of *Excretion* (q. v.). Of the *S.-glands*, the most important are the *sudoriparous* or *sweat-glands*. These are situated in the adipose or fatty tissue beneath the dermis, and consist of a convoluted tube, opening on the surface of the S. by a minute opening. Each gland is surrounded by a coil of minute bloodvessels, from the blood of which the *sweat-secretion* (consisting of water, chloride of sodium, chloride of ammonium, urea, &c.) is secreted, and finally excreted on the external surface of the body in the form of the well-known *perspiration*. The sweat-glands are most numerous in the palms of the hands (2736 to 3528 to the sq. inch) and soles of the feet. They are least numerous in the neck and back. The *sebaceous glands* of the S. are small glands, found very generally distributed over the body, and which usually open by ducts into the follicles of hairs. The *sebaceous matter* secreted in these glands (which are absent in the palms and soles of the feet) is of an oily nature, and is believed to aid in the nutrition of the hairs.

The *functions* of the S. are (1) to serve as a general covering or investment to the body; (2) as a means of exercising the sense of touch; (3) as an absorptive surface in some degree; (4) as an excretory surface; and (5) as an important means of regulating the temperature of the body. The quantity of watery vapour excreted per diem by the S. under ordinary circumstances is about 1½ or 2 lbs. The skin exhales *carbonic acid gas* in addition to the sweat, and also normally excretes traces of urea. In these latter facts the correlation of the S. with the lungs and kidneys is well seen. The S. is believed to excrete daily about $\frac{1}{200}$th to $\frac{1}{150}$th part of the amount of carbonic acid excreted by the lungs. The *absorptive* powers of the S. are presumably limited. Mercurial salivation is produced by rubbing mercury into the skin; and many other substances produce characteristic effects when thus administered. But it is still a question whether the S. can absorb water. The case of shipwrecked sailors relieving thirst by wrapping wet clothes around their bodies, is explicable on the idea that evaporation is thereby hindered. See SENSATION.

Diseases of the S.—Diseases of the S. have been variously classified by different authors. Affections of the cutaneous system may be divided into those of the skin, and those of its appendages, such as the hair, nails, and cellular tissue. Diseases of the S. may be divided anatomically into (1) exanthemata, or rashes; (2) hæmorrhages; (3) vesicles; (4) parasites; (5) blebs; (6) pustules; (7) papules; (8) scales; (9) tubercles; (10) stains; and (11) zerodermata, or unnatural dryness of the skin. The more important diseases of the S. are described under special articles.

Skinn'er, Rev. John, son of an Aberdeenshire schoolmaster, was born at Balfour in the parish of Birse, 3d October 1721, studied at Marischal College, and in 1739 became assistant teacher at Monymusk. While here he abandoned Presbyterianism and joined the Episcopal communion. In 1742 he was appointed to the charge of an Episcopal congregation at Longside, near Peterhead, where he officiated for the long period of sixty-five years, residing 'all the time in a small thatched cottage.' S. died at Aberdeen, 16th June 1807. His controversial pamphlets are long since forgotten, but his bright, genial, and humorous verse seems destined to resist the tooth of time. 'Tullochgorum,' which Burns declared to be 'the best Scotch song Scotland ever saw,' is as delightsome to-day as it was a hundred years ago. Hardly less so are 'The Ewie wi' the Crooked Horn,' 'John of Badenyon,' 'O! Why should Old Age so much Wound Us,' &c. In 1809 his *Miscellaneous Works* were published in 3 vols., with a biographical memoir by his son, Dr. John Skinner, Bishop of Aberdeen. See also Reid's biographical sketch prefixed to an edition of S.'s *Songs and Poems* (Peterhead, 1859).

Skip'ton ('Sheeptown'), or **Skipton-in-Craven**, a town in the W. Riding of Yorkshire, England, on the Aire, 26 miles N.W. of Leeds and 231 N. of London by rail, is the chief town of the district of Craven. It is a station on the Midland Railway, and an important junction for Liverpool, Manchester, Blackburn, and Lancashire with Scotland, and where all the important trains stop between London and Scotland. S. has a picturesquely situated parish church, and Christ Church, built in 1839. The Grammar School is a fine building opened in 1877, and the Midland Railway Company completed in 1876 the erection of a large and commodious station. A reservoir for S. was finished in 1877. S. is the ancient seat of the Cliffords, whose interesting castle, founded by William de Romillé at the close of the 11th c., still commands the town. The population is partly engaged in agriculture, and the fortnightly cattle-fair is one of the largest in that part of England. The town is also at present (1878) experimenting on a sewage-farm. S. has (1878) eight mills, two of which were opened in that year. The chief manufactures are cotton and wincey goods and sewing-cottons. Pop. (1871) 6078; estimated pop. (1878) 10,000.

Skir'mishers (Ital. *scaramuccia*, but originally a Ger. word meaning 'shield-bearers'), dispersed soldiers in the first line of battle. They act in front of battalions or masses of soldiers so as to cover the advance of an army and prevent surprises. During recent years the scope of S. has been widely extended in the important modifications of military science represented by the Prussian 'swarm' and the British 'advance in loose order.'

Skirr'it is an umbelliferous tuberous-rooted perennial, a native of China, from whence it is said to have been introduced into Britain in 1546. The bunch of fleshy tubers was formerly much esteemed as a vegetable for either boiling or frying, but S. is now rarely seen in the kitchen garden. Where grown it is propagated either by dividing the root or by seed, and its cultivation is in all respects similar to that of the beet.

Skittles, a game of skill played in an oblong court known technically as a 'skittle-alley.' Nine pins are set up at the one end according to a certain arrangement; and the object of the player, who aims a ball at them from a fixed distance, is to knock them all down in as few throws as possible.

Skopin', a town of Russia, government of Riasan, on the left bank of the Verda, 89½ miles E. of Tula by rail; has nine churches, and manufactures of leather. Pop. 9447.

Skob'eleff, General, a brilliant and daring Russian officer, born about 1840, is the son of a general (with whom he is sometimes confounded), and is said to be the great-grandson of a 'Scobie' from the W. of Scotland, who emigrated to Russia, and rose to distinction in the Russian navy. S. first served in Central Asia under Kaufmann (q. v.), where his extraordinary audacity and splendid courage soon won him a great name. His exploits have almost become legendary among the soldiers of the Czar. Intrusted by Kaufmann with the command of the forces sent against Khokand, he conquered and annexed a territory containing two millions of inhabitants. At the outbreak of hostilities between Russia and Turkey in 1877,

S. happened to be in disgrace at court, and came to the seat of war unattached. At the crossing of the Danube at Sistova he fought in the ranks as a private soldier, took part in the great surprise-march of Gourko through Bulgaria, obtained command of a regiment of Cossacks after the Russian disasters at Plevna, and gave material help at the recapture of Loftcha, 3d September. Appointed commander of the left wing of the Russian army at Plevna, S. stormed with frightful loss the Sofia and Krishine redoubts (September 11), but was forced to abandon them next day, was present at the surrender of Osman Pasha (q. v.), whom he was the first to greet, afterwards captured the entire Turkish force at Shipka, and marched with the victorious Russians from Sofia to San Stefano. S. is the soldiers' hero. His eccentricities enchant, as his valour inspires them. He is covered with decorations. Yet he is not a merè hare-brained enthusiast in fighting. He is a thoroughly scientific and accomplished officer, and has even more than a Russian's skill in languages, speaking and writing with ease, in addition to his native tongue, French, German, English, Italian, Roumanian, Bulgarian, Polish, Turkish, and modern Greek.

Sku'a, or **Sku'a Gull** (*Stercorarius*, or *Lestris catarrhactes*), a species of *Laridæ* or Gulls, notable for its predatory habits in compelling other gulls to disgorge their finny prey. It inhabits northern regions, and attains a length of 2 feet. The usual plumage is brown, varied with chestnut; the under parts are light-brown. Other species are the *S. cepphus*, or Buffon's S., and the Pomarine S. (*S. Pomarinus*).

Skull, the name given to the bony or cartilaginous case in which the brain of Vertebrates is protected. In Invertebrates no traces of a skull exist, except the cartilaginous capsule found in the highest molluscs or cuttlefishes, and enclosing the chief nerve-mass. The S., as mentioned in the article SKELETON, was regarded by Owen as composed of four modified vertebræ, a view from which other anatomists of repute materially differ. In its *development*, the human S. first appears as a thin capsule of membrane, enclosing the primitive traces of the brain. Its walls are continuous with those of the vertebral canal in which the *spinal cord* is contained. The *notochord*, or primitive spine, is continued along the base to the fore part of the S., at which latter point it tapers to a point. At the base of the S. the first development of cartilage takes place, this deposition assuming the form of two symmetrical portions, one on each side of the middle line. Ossification begins in the roof of the S., and the primitive membrane of the S. becomes the periosteum of its bones, and unites with the *dura mater*, or outer of the three membranes of the brain. At birth the process of ossification is further advanced in the base than at the vertex of the S., and the bones of the vertex and sides are separated by four spaces filled in with membrane and named *fontanelles*, and correspond to the union of the four angles of the parietal bones with its neighbours. The anterior fontanelles remain open until the first or second year of life; the others close soon after birth.

Anatomically considered, the S. is divisible into a *cranial* and a *facial* portion. The most prominent of the S.-apertures are the *occipital* foramen behind, this being the aperture through which the brain becomes continuous with the spinal chord. The two articular processes or *condyles* are on each side of this opening. At each side of the S. and near the occipital condyles the two blunt *mastoid* processes are seen. The *zygoma*, a kind of projecting buttress, connects face and S. together at each side, and becomes continuous in front with the *malar* prominence or that of the cheek. The *orbits* or eye-cavities and nostrils, or *nares*, are seen in front. The only bones which are separable from the adult human S. are the *lower jaw* and *hyoid bone*, the latter giving support to the tongue. In the human S. twenty-two bones are found. Eight of these form the *cranium* or brain-case, and are named as follows:—*occipital*; *parietal* (*two*); *frontal*; *temporal* (*two*); *sphenoid* and *ethnoid*. Fourteen bones enter into the composition of the face: *nasal* (*two*); *superior maxillary* (*two*); *lachrymal* (*two*); *malar* (*two*); *palate* (*two*); *inferior turbinated* (*two*); *vomer*; and *inferior maxillary* or lower jaw. In this category it will be seen the *auditory vesicles*, or three small bones found in the internal ear, are not included; nor are certain small bones named *Wormian bones* (so named from Wormius, a Danish physician), which are occasionally developed in the spaces or *fontanelles* between the cranial bones, where the process of ossification has been incomplete. These Wormian bones from their shape are also named *ossa triquetra*. The osseous or bony tissue of the S. is that seen in flat bones generally. The bones of the cranium consist of two layers of dense horny material, enclosing a network-like tissue, named *cancellated bony tissue*. The dense layers are named the *inner* and *outer tables* of the S.; and of these the outer is the thicker and tougher, the inner being often named the vitreous table from its brittle nature. The name *diploë* is given to the intervening or soft and cancellated substance. The bones of the S. are well supplied with blood by arteries which arise from the *dura mater*, and also from the inner scalp-tissue or *pericranium*.

The chief anatomical differences of the human cranium from that of the highest apes are these: the cranio-facial angle varies from 90° to 120°, whilst the brain cavity is more than 2½ times the length of the basi-cranial axis; the *superciliary ridges* over the eyebrows are but little developed in man, and he has a nasal spine; the jaws are relatively small, and the condyles by means of which the S. articulates with the spine are situated further forward on the base of the cranium than in anthropoid apes. Classifications of the human race by the variations of S. formations have been frequently proposed. Retzius proposed to divide mankind into *dolichocephalic*, or long-headed, and *brachycephalic*, or short-headed races. Other classifications remark the existence of (1) *oval*, or *elliptical skulls* (natives of W. and S. Europe); (2) *prognathous* (*e.g.*, negro and negrito); and (3) *pyramidal* (*e.g.*, Mongolian, Esquimaux).

Diseases and Injuries of the S.—The bones of the cranium are liable to be affected with all the diseases peculiar to osseous structures, such as *Caries*, *Necrosis*, &c. (q. v.). The most frequent injuries of the S. are *fractures* which may be divided into those of the *vault* and those of the *base*. The chief varieties of fracture of the vault are simple fissures, starred and comminuted fractures, fractures with depression of the entire thickness of the skull, fractures with depression of the outer or inner tables only, and fractures with elevation of the fractured portion; and any of these forms of fracture may be simple or compound. Fractures with depression of one table only and elevated fractures are rare, but the other forms are of frequent occurrence.

The only diagnostic signs of a simple fracture of the skull are the symptoms of depression by which it may be accompanied. The gravity of the injury depends entirely, or chiefly, upon the amount of depression; and if there be no depression, a simple fracture is not more serious than a fracture of any other bone.

The *treatment* of an undepressed fracture consists merely in such precautionary measures as watching for and treating any cerebral symptoms which may arise; and if the fracture be compound, the usual measures should be adopted to promote the healing of the wound. In cases of simple depressed fracture accompanied by symptoms of compression, or of irritation of the brain, the depressed portion of bone should be elevated by operation, but not otherwise. Depressed compound fractures should also be elevated if there be symptoms of compression, and some surgeons follow the practice of elevating even in cases where there are no symptoms of compression, but the judiciousness of this is somewhat doubtful.

Fractures of the base of the S. may be caused by direct violence; but, in the great majority of cases, they are extensions downwards of fractures of the vault, and are caused by indirect force. Fractures of the base caused by direct violence most frequently occur in connection with wounds of the orbit; or the condyle of the lower jaw may be driven through the base of the S. The great majority of the fractures caused by indirect violence pass through the middle fossa of the base. Sometimes a fracture of the base may originate in a shock transmitted through the spine to the base of the S., as when a person falls on his feet from a considerable height. In some cases the fracture is confined to the base, but it generally extends up into the vertex.

The symptoms of fracture of the base of the S. are the escape of the contents of the cranial cavity, viz., blood, subarachnoid fluid, or brain-matter through the fissure, or injury of the nerves which pass through the foramina at the base of the skull; but the usual symptoms are either extravasation of blood or escape of the subarachnoid fluid. In fractures of the anterior fossa, there is extravasation of blood in the deep cellular tissue of the orbit, and afterwards under the ocular conjunctiva and the

lids; or the blood may pass through the sphenoid bone into the nose, causing persistent epistaxis. The latter condition may also occur in fracture of the middle fossa; but, in such cases, the hæmorrhage is more frequently from the ear, the membrana tympani being lacerated, and affording a passage for the blood from one or other of the large vessels in its neighbourhood. In fractures of the posterior fossa, the extravasation may be at the mastoid process, in the occipital region, or at the side of the neck. The most important and unmistakable sign of fracture of the base is the discharge of serous fluid from the ears. A copious discharge of watery, saline fluid from the ears can come only from the subarachnoid space. Lesions of the nerves which pass through the foramina at the base are of frequent occurrence in fractures of the base; and paralysis of the nerves, especially of the seventh pair, occurring in connection with an injury of the S., is a strongly confirmatory symptom, though not unequivocal, as paralysis may result from extravasation into the substance of the nerve, or it may follow an injury of any kind.

Fracture of the base of the skull is a very grave injury, and though generally fatal is by no means necessarily so. The only treatment is that which is appropriate for the concomitant injury of the brain.

Skunk (*Mephitis*), a genus of Carnivorous mammals included in the weasel family (*Mustelidæ*) and occurring in the New World, where they are widely distributed. The *M. putorius* is the common species, and attains a length of about 18 inches, exclusive of the tail. The colour is a dark-brown variegated with lighter streaks, and the tail is long and bushy. The fur is valuable. The S. is most notable for the persistent and highly disagreeable odour of its *anal glands*. The nauseous odour of this secretion has, in fact, become proverbial. It impregnates any article of clothing so as to be incapable of removal, and a very small quantity of the fluid ejected by the animal when irritated is sufficient for the purpose. The secretion is said to possess therapeutic properties.

Skye (Gael. *Ealan-skianach*, 'winged island'), after Lewis the largest of the Scottish islands, and the most northerly of the Inner Hebrides, is included in Inverness-shire. Area, 547 sq. miles; pop. (1871) 17,330. Separated from Ross-shire in the N.W. by the Sound of Rona, and from Inverness in the S.W. by the Sound of Sleat, it approaches within half a mile of the mainland between these two channels at Kyle Rhea. It is very irregular in shape, and is so cut up by inlets that no part of it is more than 4 miles from the sea. The chief inlets, all towards the W. and N., are Lochs Eishart, Slapin, Scavaig, Bracadale, Follart, and Snizort; the principal headlands are Aird Point, Ru-Huinish, Dunvegan Head, and Vaternish Point, which are extremities of the peninsulas of Duirinish, Vaternish, and Trotternish in the N., and Sleat Point in the S. Its extreme length from Aird Point to Sleat Point is 47 miles; its greatest breadth, from Portree to Copnahow Head, 22 miles. S. is a wild, highland country, and its rocky mountains and precipitous headlands are shrouded in the mists of the Atlantic. The southern portion, however, is 'comparatively soft and green,' the long promontory of Sleat being the 'best wooded, the sunniest, and the most carefully cultivated' part of S., with its larch plantations and trim hedgerows. Towards the S.W., bounding Loch Scavaig, are the romantic Cuchullin Hills, jagged and precipitous, attaining their greatest height of 3183 feet in Scuir-na-Gillean. The outlying Blabhein (pronounced Blaavin), 3200 feet high, rises to a narrow ledge, overhanging a lofty precipice on either side. Among the Cuchullins lies Loch Coruisk, the most savage scene of desolation in Britain. Its dark-green waters are girt with tiers of cliffs and steep rocky slopes strewn with gigantic masses of hypersthene. Glen Sligachan, 'to which Glencoe is Arcady,' passes N. between Scuir-na-Gillean and Marscow, to the eastern loch of the same name. Near the E. coast, 7 miles N. of Portree, the Storr (2348 feet) rises conspicuously. Its summit is cut vertically for 500 feet, and is fenced with fantastic pinnacles, while the steep declivity below is littered with detached rocks. In the bleak promontory of Trotternish rises the Quiraing (1774 feet), perhaps the most singular sight in S., happily described as 'a nightmare of nature.' It is a natural basaltic cathedral, formed by huge fluted columns of basalt, and rugged pyramidal masses, in the midst of which stands a truncated rocky hill. This hill, the Quiraing proper, rises abruptly; its sides are worn by rivulets and ribbed with fissures, and at its top is a spacious, verdant plateau, 100 paces by 60. The coast to the S. and E. of the Quiraing presents basaltic formations, at various points rivalling in size those of Staffa and the Giants' Causeway. Here and there the base of the cliffs is hollowed into remarkable caves (*e.g.*, Prince Charles' Cave), and their face is worn by waterfalls. The N. part of S. is still spoken of as 'Macleod's country,' and the southern part is the country of the Macdonalds. Macleod's Tables are two contiguous hills in the E. of the island, flat-topped as a dining-table, and covered far into spring with a layer of snow. Macleod's Maidens are three spires of rock, rising sheer out of the sea. S. has no rivers, but the streams at Skeabost, Portree, Ose, Hammer, &c., afford salmon and sea-trout fishing. In the bays there are profitable fisheries—herring, cod, ling, saithe, oyster, &c. On account of the humidity of the climate, agriculture is almost abandoned, only green crops being produced in any quantity. Sheep-farming and cattle-rearing are the chief occupations, and important fairs are held at Broadford. Game, which was formerly plentiful, is now scarce. The inhabitants are mainly Celtic, and universally speak Gaelic, although the use of English is gradually increasing. There is a strong Norse infusion, and the names of the northern headlands are Norwegian, not Gaelic. Since 1851 the population has decreased, chiefly by emigration, to the extent of one-fifth. The chief families in S. are the Macdonalds of Sleat, who trace their descent to the Lords of the Isles, and the Macleods, originally Norsemen, who still occupy old Dunvegan Castle. The island is historically interesting as the home of Flora Macdonald and the refuge of Prince Charles. At the old house of Kingsburgh Flora entertained Dr. Johnson and Boswell in 1773. The grave of Flora in the churchyard of Kilmuir, long in a state of sad neglect, was marked by the erection of an Iona cross, a granite monolith 28 feet high, in November 1871. In the winter of 1877, however, the monument was blown down and broken into five pieces by a strong westerly gale. Four bridges over the S. streams were in course of erection in 1878. There are masterly descriptions of S. scenery in Scott's *Lord of the Isles*, and in Black's *Princess of Thule*. See also Alexander Smith's *Summer in S.* (Lond. 1866).

Sky'lark. See LARK.

Sky'ro (anc. *Skyros*), an island in the Grecian Archipelago, the largest and most easterly of the northern Sporades, belonging to the nomarchy of Egripo. Area, 64 sq. miles; pop. (1870) 3029. It is mountainous in the S., but the N. part has fertile plains which yield abundant crops of wheat. Wine, olives, and honey are exported. Coloured marble is produced, and in the N. half of the island are numerous ancient quarries. The only town is S. on the E. coast. Pop. 2029.

Slag, the fused and hardened refuse from smelting-works, glass-foundries, &c. The different varieties of S. are silicates of lime, alumina, &c., often beautifully crystallised, and very variously coloured by the different metals. S. from ancient smelting-works frequently contains a sufficient proportion of metal to pay for its further extraction under our improved methods. Among the various patents which have been taken out for the utilisation of the immense quantities of S. produced every year, none have as yet been perfectly successful. It is sometimes cast into blocks of the size of bricks or larger, and used for building houses or paving streets. Broken S. is also often laid upon roads and garden-walks, though it forms a somewhat ugly and uncomfortable pavement.

Slan'der is, in law, an injury done by speech to the character of a person. Any words injurious to the person spoken of in his business, or social position, may be S. Though much will depend on the *animus* of the speaker, there may be S. without malice. The legal remedy for the injury is an action for damages. To this the defence may be that the words imputed were not spoken; or that they were true and justifiable. See LIBEL.

Slang, the secret jargon of thieves and vagabonds, otherwise known as Cant or Flash, and answering to the Fr. *Argot*, Span. *Germania*, Ital. *Lingue Furbesche*, Ger. *Rotwälsch*, and Russ. *Afinskoe*. Although confounded by Ben Jonson, Beaumont and Fletcher, Scott, and Disraeli, S. and the Romani or Gypsy

tongue are as distinct as 'Pidgin English' and the language of Shakespeare's plays. Yet Romani probably suggested to 'valiant roags' the manifold advantages of a speech not understanded of constables; and out of words picked up from Jewish receivers of stolen goods, from Gypsies, and heaven knows whence besides, they concocted with the assistance of copious metaphors a jargon as patched and piebald as *Hudibras'* Babylonish dialect. Thus modern English S. has its Romani elements, *pal* (R. *pral*, 'brother'), *cosh*, 'life-preserver' (R. *kosht*, 'a stick'), *dust*, 'money' (R. *dosta*, 'plenty'), &c.; its Welsh, as *win*, 'a penny' (W. *gwen*, 'white'), and *skipper*, 'a barn' (W. *ys-gubor*); its French, as *vile*, 'a town,' *nysey*, 'a simpleton' (F. *niais*); its German, as *slang*, 'a chain' (G. *schlange*, 'serpent'); its Italian, *e.g.*, in '*scarper* with the *feeley* of the *donna* of the *carser*' (*scappare colla figlia della donna della casa*); even its Latin, as *pannum*, 'bread,' and '*grannam*, 'corn.' Then, as already stated, there are a host of metaphors, like *dew-beaters*, 'feet,' *canaries*, 'sovereigns,' *devil-driver*, 'parson,' and *fall of the leaf*, 'the gallows drop.' And it is much the same with Continental jargons, Rotwälsch containing 137 Romani words, about as many French, and numerous metaphors, as *teller*, 'wheel,' *regenwurm*, 'sausage,' &c. It is curious how the same words and concepts often crop up in widely-different jargons, proving the close-knit union of knaves' fraternities. For instance, the S. *cocum*, 'sly,' *gonnof*, 'thief,' and *shickster*, 'lady,' reappear in Rotwälsch as *kochum*, *gonof*, and *schikse*; *red-rag*, for 'tongue,' is matched by the Argot *chiffon rouge*; and while your Spanish bravo calls 'fingers' *mandamientos*, in *The Four P. P.* (1540) it runs, 'The wife's ten *commandments* may search thy five wits.' Curious, too, is the antiquity of much modern S. In Fletcher's *Christ's Victorie* we light on *bouzing kan*, in the *Merry Wives of Windsor* on 'what the *dickens*,' in the *Conflict of Conscience* on 'but *to the pot* he is sure to go;' and *tick*, *cove*, *beak*, &c., were current at least two centuries ago. How wary the 'slangologist' has need to be is shown in the countless puerile etymologies of Grose and Hotten, or in Mr. E. P. Tylor's derivation of *conk*, 'a nose'—whence *conky*, the Duke of Wellington's familiar nickname—from the 'spouting *concha* of classical fountains.' It is simply a case of back-slang, the inverted gibberish of London costermongers, *conk* equalling *hnoc* or *nok*, the Romani for 'nose,' which further appears in the S. *nark*, 'a *nose* or spy.' See the works cited in Hotten's *S. Dictionary* (new ed. Lond. 1874), and in Miklosich's *Zigeunerische Elemente in den Gaunersprachen Europa's* (Vien. 1876).

Slate, a hard metamorphic rock which splits readily into thin layers, not necessarily in the plane of the original bedding, but in a direction cutting this at a variable angle. This phenomenon is due to *Cleavage* (q. v.). True slate is exclusively obtained from the Cambrian and Silurian formations: to fulfil its purpose it must be hard and fissile; but in colour it varies greatly, from grey and green to blue or black. Besides the small thin slates used for roofing purposes, and for writing, large slabs are employed for billiard-tables to ensure a level surface. S. is found in Wales, Cornwall (Tintagel and Delabole), the Lake District, Argyleshire, Perthshire, and other British localities, in geological horizons not higher than the Carboniferous, and mainly Cambrian and Silurian. North Wales (in the mountains around Llanberis, Bangor, and Festiniog) produces more slate than any other country; the total output during 1877 amounted to 600,000 tons, while the total production of the British isles during the same period was estimated at 750,000 tons. The export from Great Britain in 1877 amounted to 37,565,282 'tales,' valued at £294,515, of which Germany took £210,438 worth. In slate-quarrying large blocks are removed by blasting, and are broken into smaller blocks, two inches thick, and of several widths suitable for splitting into slates, the main use of which is in covering the roofs of buildings. Blocks of slate unfitted because of unusual hardness for slate-making are planed down and sawn into slabs. These are afterwards ground, scoured, and polished for use as dairy fittings, in constructing cisterns and tanks, billiard tables, drawing-boards, and pavements, and after being 'enamelled' and decorated in imitation of marbles and porphyries, as chimneypieces and architectural panels. Welsh roofing-slates from Bangor quarries in Carnarvon are unequalled for lightness, thinness, and uniform colour; Westmoreland slates are much esteemed; while Scotch slates from Ballachulish and Easdale quarries are rougher, thicker, and more durable than English varieties. Tough and heavy slates are procured from several Irish localities. The trade names and sizes of roofing-slates are: 'ladies' 15 inches × 8 inches, 'viscountesses' 18 × 10, 'countesses' 20 × 10, 'duchesses' 24 × 12, 'princesses' 24 × 14, and 'queens' 36 × 24. 'Doubles' measure 13 × 7 or thereby, and in Scotland a slate of less dimensions is termed 'undersize.' Slating is the industrial art whereby the boards, battens, or laths on a roof are covered with slates. The slates are dressed to a uniform width or 'gage,' and sorted in lengths. Two nail-holes are punched near the 'head' of each S.; the nails used are of copper or galvanised iron. The slates are placed in courses on the roof, the longest next the eaves and the shortest at the ridge. The courses break joint, and overlap twice, the lower edge of the third course covering a few inches of the first course, and so on. Scotch slates are irregular in thickness and are not trimmed to a uniform gage; greater care is therefore demanded of the workman for their proper disposition on the roof, in order to have it perfectly water-tight.

Mica and *Hornblende* S. contain the minerals named. *Whet* S. has much silica in its composition, and is used for hones. *Drawing* S. or black chalk contains carbon, and is employed for crayons. *Polishing* S. is very fine grained and of a yellow colour. See D. C. Davies, *A Treatise on S. and S.-Quarrying, Scientific, Practical, and Commercial* (Lond. 1878).

Slate-Pencils are thin cylinders of slate used for writing on school-slates. 'Prepared S.-P.' are made after the manner of black-lead pencils, a thin parallelopiped of compressed slate-powder being substituted for one of plumbago.

Slave-Coast, a name given to the northern coast of the Bight of Benin, from Lagos to the Volta River. Besides Lagos, its chief ports are Badagry, Whydah, and Palma.

Sla'very, the state in which one man is another's property, originated in the primeval code of warfare by which a captive's death was exchanged for a life of bondage, as much from covetous as merciful motives. Then the same family feeling which led to hereditary dignities, ordained that the man who had forfeited personal liberty had likewise forfeited the liberty of his children, and thus by degrees a servile class arose. Everywhere this class was constantly recruited by insolvent debtors, by criminals, and by freemen who sold themselves as slaves; but the servile condition varied greatly in different countries and at different times. The mildest form of S. the world has seen was that amongst the Jews. So mild was it that sometimes a Hebrew bondman would not accept the liberty offered him by the law of Jubilee (q. v.)., whilst even foreign slaves were strictly protected by the Mosaic legislation, were admitted members of the Jewish faith, and did they escape, might not be given up. Far otherwise was the lot of a slave in Greece or Italy. Ancient philosophers denied to him the right, not merely of citizenship, but of humanity itself. He was to them an animated chattel, who differed from his master as utterly as brutes from man, devoid of forethought, incapable of government. So argued Aristotle in his *Polity*, blind to the fact that slaves might have once been free, or might at any time acquire freedom. Hence all his precepts concerning the treatment of slaves are addressed solely to the owners' self-interest, and how feeble a restraint this often proved is shown in the cruelties that led to 'Servile Wars.' Neither did Christianity combat the principle of S., though from the first it must have tended to better the condition of slaves. The Fathers of the Church seem not to have dreamed of the possibility or advantages of a general enfranchisement; the Church itself held slaves; under the Christian emperor Justinian a bondman's testimony against his master continued worthless; and as late as the 9th c. Basil the Macedonian vainly enacted that servile marriages should receive the priestly benediction. Chiefly to men's awakening sense of the dignity of labour was emancipation due; its progress was gradual and not unmixed with evil. As amongst the Jews there were the two classes of native and foreign slaves, so in the Greek, the Roman, and the Teutonic system we find various degrees of personal dependence, and may distinguish absolute slaves from *periœci*, *clientes*, *lætas*, &c. There was, however, a constant tendency towards the fusion of slaves and such 'unfree,' by raising the former while lowering the latter class. In England we mark this process in the creation of the intermediate class of villains *regardant* from *theows* and *ceorls*. Already before the Conquest many causes were uniting to lower the status of free-

men, who under Eadward the Confessor had each their lord; but in *Domesday* the free landowner, who could go where he would with his land, is still entirely distinct from the personal slave, liable to be sold and shipped off to Ireland. In the succeeding century, however, the manorial system, by changing free commendation and tenancy into servitude both of man and land, thrust down the *ceorl* into a semi-slavish state; while at the same time absolute slaves, finding no place in the feudal theory, rose to the semi-freedom of villainage. Neither S. nor villainage were ever formally abolished, but the former had ceased to exist in the 12th, the latter in the 16th c. Russian serfdom bears a close analogy to English villainage, so far as *adscriptio glebæ* lay at the root of both; but the serfs came far nearer S. than did ever the villains. At the outset of Russian history the population consisted of slaves, of free agricultural labourers without a fixed abode, and of the peasants proper; at the beginning of the 18th c. all these three categories were blended under the common head of serfs. The primary cause, according to Mr. Wallace, of this great change was that, though peasants were anciently free to wander at their will, there was always, in a country so thinly populated as Russia, a tendency on the part of proprietors and communes to hinder migration. This was difficult so long as the land was broken up into a number of principalities, when one landowner could tempt his neighbour's labourers to settle upon his own estate. But with the establishment of the tsardom of Moscovy and the feudal granting of land to *boyars* with a certain number of hands to till it, new reasons for and means of fixing the peasants to the soil arose; and whilst they retained their civic rights, they lost the privilege of changing their domicile. The tie between master and servant once rendered indissoluble, the rights of the weaker soon yielded to the stronger's might. If land might be sold, the peasants attached to it of course were included in the bargain; and from this it was but a step to the sale of peasants apart from land, as allowed by the *ukázes* of 1682. Peter the Great grouped slave and peasant under the common head of serfs, effecting thereby the final obliteration of class distinctions; and his successors in various *ukázes* (1742-66) permitted proprietors to punish unruly serfs by the knout or by perpetual banishment to the mines. Under Catharine II. serfage attained its climax, 'serfs being bought, sold, and given in presents in hundred and thousands, sometimes with the land and sometimes without it, sometimes in families, and sometimes individually.' In 1768 a lady was brought to trial, who in eleven years had murdered one hundred serfs, most of them girls; and the cruelties of Count Arakchéyef, in the beginning of this century, were hardly less horrible. But with Alexander's accession (1801), began a series of attempts at emancipation, which in the face of strong national opposition resulted in the law (February 19, 1861), by which 21,625,609 serfs received their freedom.

Meanwhile, there had grown up in the New World the gigantic system of negro S. The natives of Hayti, forced by their Spanish conquerors to labour in the gold-mines, dwindled in twenty years from 2,000,000 to 14,000; and Las Casas, to save the remnant, suggested the employment of negroes in their stead. Accordingly in 1510 Karl V. conferred on a courtier a patent to transport 4000 Africans a year into the island, and thus the slave-trade was begun. England and other countries soon followed Spain's example, with the result that at the beginning of the present century the number of negro slaves in North and South America and in the West Indian islands was estimated at over 4,000,000 souls, one half of whom belonged to the United States. On the cruelties of the traffic there is now no need to dwell; the world has acknowledged by renouncing them. The history of its abolition is briefly this:—In 1787 a society was formed in London by Dillwyn, Granville Sharpe, Clarkson, and Wilberforce, for the suppression of the slave-trade; and coldly countenanced by Pitt, warmly by Fox and Burke, its members achieved their end after twenty years' defeat, their measure receiving the royal assent 25th March 1807. Twenty-three days before a similar act was passed by the Congress of the United States, where since 1762 the Quakers, supported by Washington, Franklin, and Jefferson, had pleaded the cause of anti-S. Slowly and reluctantly Spain, France, and Portugal followed the example, and the slave-trade became piracy in the eye of international law. But this abolition of the slave-trade was only the prelude to a fiercer contest, waged for the abolition of S. itself. In 1833 an Act, introduced by the late Lord Derby, emancipated the slaves of the British colonies, their owners receiving £20,000,000 as compensation; and by 1820 S. had ceased to be a power in all the American States to the N. of Delaware and Maryland. In that year the famous 'Missouri Compromise' established that S. should never exist above the parallel of 36° 30' N. lat. (see MASON AND DIXON'S LINE); its repeal (1854) left Kansas and Nebraska the choice whether they were to be slave-holding territories or no. Lincoln's election to the presidency (1860) decided the question in the negative, and this decision led to the withdrawal from Congress of the senators and members of seven of the Southern States. The history of the Civil War that followed belongs to the history of the United States (q. v.); enough that it ended in the abolition of S. throughout the Union, 31st January 1865. S. had already ceased in every part of the American continent except Brazil, and there the Act of 1871 has freed the slaves belonging to Government, whilst ensuring liberty to all children born after the date of enactment. See De Wette's *Lehrbuch der hebräisch-jüdischen Archäologie* (4th ed. Leip. 1864); vol. x. of Grote's *History of Greece* (new ed. Lond. 1872); vol. v. of Freeman's *Norman Conquest* (Oxf. Clar. Press, 1876); Mackenzie Wallace's *Russia* (2 vols. Lond. 1877); Clarkson's *History of the Abolition of the Slave-Trade* (2 vols. Lond. 1808); Goldwin Smith's *Treatise on American S.* (Lond. 1863); and H. Wilson's *History of the Rise and Fall of the Slave Power in America* (3 vols. Bost. and Lond. 1874).

Sla'vic Nations form a large and important branch of the Aryan family, numbering about 80,000,000, and occupying nearly a third of Europe. Of their history prior to the 6th c. of our era, little is known with certainty. Their ancestors, together with those of the Letts and Lithuanians, are supposed on linguistic evidence to have been once united in a Letto-Slavic group; but the separation of the Lettic from the Slavic family must have taken place at a very remote period. No evidence exists, even in tradition, as to the time at which the Slavs entered Europe, but their wave of immigration appears to have been later than the Celtic, Græco-Italic, and Teutonic waves. The eastern shores of the Baltic, in the neighbourhood of which are still found the dwindling remains of the Lettic races, are claimed as the early homes of some Slavic tribes, while others are supposed to have long dwelt near the northern shores of the Black Sea, or roamed over the vast tract vaguely designated as Sarmatia, stretching from the Caspian towards the mouth of the Vistula. From the 5th c. B.C., they are supposed to have existed in Europe for nearly a thousand years without materially affecting its history, at first confused in the opinion of the ancients with Scythians and other unfamiliar races, afterwards more clearly distinguished by Greek and Roman writers as *Venedi* or *Veneti* (a name suggestive of the German *Wenden*). At length a southern movement seems to have brought them into contact with the Roman Empire, and in the 6th c. of our era they appear in the works of the historians Jornandes and Procopius as *Sclavini* or *Sclabenoi*; names from which comes the superfluous *c* in the word 'Sclavonic.' The origin of the name *Slâv* is uncertain. It has been derived from *slava*, glory, and from *slovo*, a word; the latter derivation being supported by the fact that the Slavs termed foreigners *Nyemtsy*, dumb, *i.e.*, 'wordless.' The name Serb or Servian is also of doubtful origin. Attempts have been made by hostile critics to connect it with the Latin *servus*, but they involve a false etymology. The words 'slave' and 'Slav' are undoubtedly connected, but only because so many Slavs were in the course of time reduced to servitude did their name become a synonym for a thrall. Ranked at first among the barbaric foes of the Empire, the southern and western Slavs gradually became civilised, entered into alliances with the Emperors, accepted Christianity, and founded principalities which for a considerable time flourished prosperously. Bohemia, Moravia, Servia, and Bulgaria, were all important Slav states, which long maintained their independence. Poland was another, and it held its own until modern times. The northern Slavs were not all equally fortunate, many of their tribes being gradually driven out or absorbed without ever attaining to political importance. But in the N.E. a combination of Scandinavian rulers and Slav subjects laid the foundations of the power which eventually developed into the Russian Empire.

Polity, Religion, Culture, &c.—There never seems to have been any political cohesion between the various S. N. The idea

of Panslavism, of Slavonic unity, is a modern creation, due principally to a religious sentiment. In ancient times each tribe of Slavs appears to have been independent of the rest, itself divided into a number of self-governing clusters of family-communities. Each of these clusters was among the western Slavs called a *jupa*, and had at its head a ruler who bore the title of *jupan*. In the centre of the *jupa* was the *grad* or town, in which business was transacted and religious rites were performed. Each head of a family-community was supreme within its limits, ruling his household with patriarchal power, and, at least among the eastern tribes, being priest as well as judge. Agriculture was everywhere the main pursuit of the Slavs, who are therefore supposed to have been of a peaceable nature, though they fought bravely when attacked, surrounding themselves with a rampart of linked cars. Of their religion in general not much is known. Accounts have been preserved of the temples and rites of some of their tribes, especially of the Baltic Slavs, on whom, however, much influence seems to have been exercised by Lithuanians and Scandinavians. But with respect to the religious ideas of the great majority, scarcely any direct evidence can be cited. Allusions to the ancient gods are found in the popular songs which exist in such numbers among all Slav races, but no compiler of a Slav Edda has ever arisen. A collection of Bulgarian popular poems was commenced in 1874, under the title of *Le Veda Slave*, which professed to throw much light upon Slav mythology, but it has not been accepted as a trustworthy guide. Like the other Aryan races, the ancient Slavs appear to have based their religion upon the reverence they paid to the forces of nature and to the spirits of the dead. The chief deity worshipped by at least the eastern and southern tribes was the thunder-god Perun, the Perkunas of Lithuania, whom mythologists are inclined to identify with the Vedic Parjanya. With him were linked in honour a pastoral divinity named Volos, a Dazhbog or 'Day-god,' 'Ogon' or Fire, a being evidently akin to the Vedic Agni, and Svarog, the Slav counterpart of the Vedic Varuna and the Hellenic Ouranos. Along the Baltic special reverence was paid to a Triglaf, a Sviatovit, and other divinities, represented by idols having several faces or heads. After the introduction of Christianity, the worship of these and similar divinities was long kept up by the different Slav tribes in unfrequented spots, and to this day numerous superstitious ideas and rites point to the once prevalent belief in them, such as the sacrifices employed to avert cattle-plagues, and the credence given to stories about Domovoys, Rusalkas, Vilas, and other supernatural inhabitants of fields, forests, hills, and streams. To the present day also have survived customs which, though now connected with Christian ceremonies, are really survivals of old rites performed in heathen times on behalf of the dead. About the language spoken by the ancient Slavs it is possible to speak with more certainty, as records exist which show what was its nature a thousand years ago. There were, no doubt, many dialects spoken at that time by the various Slavic tribes, but they seem to have long continued to be very closely allied. And therefore the translation of the Scriptures which was made for one set of Slav converts to Christianity might well suffice for another. When the inhabitants of the extensive principality known as 'Great Moravia' accepted Christianity in the 9th c., their first teachers, the Greek monks Cyril and Methodius, translated the Bible for their benefit, inventing for the purpose the alphabet known as the Cyrillic. This translation, written in what is generally called 'Old Bulgarian' or 'Church Slavonic,' still forms the authorised version of the Bible for the whole Slavonic race. It represents the language of their ancestors as it existed in the 9th c., one which is no longer understood anywhere by the common people, but which does not differ much more from that now spoken by some of the S. N.—the Russians and Servians for instance—than the English of the 14th c. differs from that of the present day. Modern Slavs may be divided linguistically into two branches, the eastern and the western. And this division may be used also to distinguish them, though not with the same precision, according to their religious doctrines, for the great mass of the eastern Slavs belong to the Greek Church, of the western Slavs to the Church of Rome. The eastern group comprises the Russians, Servians, Bulgarians, and a number of races akin to the Servians. The western contains the Poles, the Czekhs of Bohemia, Moravia, and Hungary, and the Wends of Lusatia. An educated Slav can generally understand, or at least very quickly learn, the dialect spoken by any member of the branch to which he belongs. But the speech of an eastern Slav is generally unintelligible to a western. A Pole will easily communicate with a Czekh, but a Lusatian Wend will find little that is familiar to his ear in Russian or Servian. And the difficulty of communication between the members of the two branches is increased by the difference between the alphabets they use, the eastern Slavs employing, as a general rule, a modified form of the Cyrillic, and the western having adopted the Roman.

Ethnography.—It is not quite so easy to divide and group the existing Slavs. The majority of the 'Great Russians'—that is to say, the inhabitants of the greater part of Russia in Europe, the 'White Russians' and 'Little Russians' being excluded—seem to be descended from Slav settlers among Finnic races, who intermarried with, and forced their language upon, the original inhabitants of the lands they colonised. The 'Little Russians' of the S.W. provinces appear to be of purer Slav descent, and less akin to the 'Great Russians' or 'Muscovites' than to the Poles with whom they were so long politically united. Among the speakers of 'Serb' dialects—the Servians, Croatians, Bosnians, Slovenes, 'Slavonians,' Dalmatians, and above all the Montenegrins—the Slav type appears to have been preserved in comparative purity. But they differ among themselves in many respects, especially as regards religion. Of those who are under Austrian rule, the majority belong to the Church of Rome, while the rest are for the most part members of the Greek Church. In Bosnia and Herzegovina many of the inhabitants, though certainly of Slav origin and speaking a Slav tongue, are Mohammedans. But their case is a singular exception to the general rule. For the eastern Slavs, in spite of their long subjection to Turks and Tartars, clung to their Christianity with a firmness in striking contrast to the docility with which, at the command of their own princes, their ancestors gave up their heathenism. To what race the modern Bulgarians belong is uncertain. They speak a Slav language, but one which has been considerably modified. It has lost its infinitive, it has accepted the use of an article, it has borrowed a great number of Turkish words, and it has undergone other changes. Still it retains its original Slavonic character. But the people who speak it appear to be the descendants of a tribe not belonging to the Aryan family, but who settled down among Slavs and adopted their speech. Of the members of the western branch, the Poles seem to have kept nearest to the old Slav type. For the original nature of the Czekhs, owing to the long union of their principalities with German states, has become considerably modified, a large German element having entered into their constitution. Both the Poles and the Czekhs belong to the Church of Rome, but the two races differ widely in the degree of their attachment to it. The long antagonism of Poland to Russia has produced an intense devotion on the part of the Poles to the Vatican, the constant foe of the Russo-Greek Church. The national movement among the Czekhs against their Roman Catholic German rulers, gave rise in the 15th c. to a Protestant feeling, which culminated in the teaching of John Huss and Jerome of Prague, and the armed resistance of their adherents, and has of late induced some of their leaders to look favourably upon the Eastern Church. The Wends of Lusatia, the last remains of the once numerous and flourishing races settled along the course of the Elbe, are closely linked by language with the Poles and Czekhs; but they differ from them in religion, the great majority being Protestants. They have become to a great extent peacefully Germanised. Of the once flourishing Slav settlements along the Baltic, from Kiel to Danzig, but few remains are now to be found, though here and there appears among German neighbours some hamlet where Slav customs and a Slav speech are still to be recognised. See Shafarik's *Slaw. Alterthümer* (Ger. trans. Leip. 1843); *History of the Slavic Language and Literature* (Ofen. 1816); Mickiewicz's *Lectures on Slavic Literature* (4 vols. Leip. 1849); and *Veda Slovena; Le Veda Slave*, edit. by E. J. Verkovitch (vol. i., Belgrad. 1874).

Slavo'nia, a former kingdom now constituting with Croatia (q. v.) an Austrian Crown-land, has an area of 3644 sq. miles, and lies between the Drave and Military Frontier. Formerly part of Pannonia (q. v.), it was seized by Dalmatian Slavs in 797 A.D., was long contended for by Hungary and Byzantium, but in 1165 fell to the former power. It was held by the Turks from 1524 till 1699, when the Peace of Karlowicz restored it to Leopold I.

Slea'ford, a market-town of Lincolnshire, England, on the Slea, 14 miles E.N.E. of Grantham by rail; has a cruciform parish church (1271-1403), with a spire 144 feet high; almshouses (enlarged 1858) and a grammar-school founded by Robert Carre in 1604; and a Second Pointed cross, 70 feet high, erected (1850) as a testimonial to Mr. Handley, M.P. for S. Lincolnshire. S. publishes one weekly newspaper, and has a considerable trade in agricultural produce. Pop. (1871) 3735.

Sleep, the state of suspension of the active powers and mental faculties which recurs as a normal part of the existence of higher animals. The obvious use of S. is specially a nutritive one. Through the rest afforded to the various organs in a state of repose nutrition is subserved. Especially is this the case with the nervous system, the functions of which during S. are suspended and abrogated in a general sense. The alternation of work and rest afforded by the recurrence of S. is paralleled by the occurrence of periods of rest in the work of the continuously-operating organs of the body. Thus a distinct interval occurs in the work of the heart,—the period of work, like that of rest, averaging about half a second. The respiratory muscles have a larger interval, averaging about 2 or 3 seconds. In the case of the brain, of which the active functional period is long and protracted, there exists an absolute necessity for a lengthened period of rest. In S. the requisite conditions are therefore complied with by the supervention of unconsciousness for a longer or shorter period. The exact condition of the brain during S. is still a matter of hypothesis, as also are the determining *causes* of S. Arguing from a pathological standpoint, physiologists generally maintained that the condition of the brain in S. was one of congestion. Its vessels were presumed to be distended with blood, and S. thus became in some degree analogous to the condition of insensibility produced by pathological congestion. Experiments conducted upon the brain-surface, however, led to the opposite conclusion. The brain is observed during S. to become pale and anæmic. Dr. Hughlings Jackson has also observed that the optic disc becomes pale during S., and this latter fact would seem to confirm the previous conclusion. The consideration of the general physiology of the blood-supply of the brain leads to a similar result. Blood supplied to the brain in S. is required in less quantity than in the waking state, since there exists in S. merely a nutritive demand, and not one calling for a large supply of blood for transformation into nerve-force. The physiological and proximate cause of S. is therefore regarded as being an anæmic condition of the brain, and the conditions determining S. may be considered simply as those which, through over-exertion or from normal exercise, produce nervous lassitude and conditions favouring anæmia. The relation of S. to dreams and somnambulism affords material for further researches on S. itself. Many physiologists hold that the normal S. is a dreamless one; others maintain that we may dream even in profound S., but that we do not remember our dreams. In dreaming, the cerebrum is regarded as active in part. In somnambulism we have an acted dream, with activity of motor centres, although confessedly in certain cases of somnambulism—as where mathematical problems have been solved, &c.—there are elements which render the entire phenomena very difficult of explanation. Cases of *protracted* S. are on record in which long periods of S. extending to forty and fifty days, and even to nearly a year, were observed. Such cases became of pathological interest, as also do those in which S. has been delayed for long periods. *Age, state of health, temperament,* and above all *habit,* are the chief causes which modify S. As an instance of the power of habit to modify S., Dr. Carpenter cites the case of Sir Edward Codrington, who, when serving under Lord Hood as signal-lieutenant with the British fleet, had frequently to remain on duty for nineteen hours at a stretch. His hours of sleep were so profound that no ordinary noise could awake him, but the word 'signal' whispered in his ear at once aroused him. A dominant idea thus serves to modify the sleeping habits, a common example of this fact being found in the habit acquired by many persons of awaking at a given hour fixed upon at bedtime. See Macnish, *Philosophy of S.* (1850); Macario, *Du Sommeil* (1857); Durham, *Physiology of S.* ('Guy's Hospital Reports,' 1860); Maury, *Le Sommeil et les Rêves* (1865); Hammond, *S. and its Developments* (1869).

Sleep of Plants is a name popularly given to the phenomena exhibited by certain plants which at night depress their leaflets, as in the wood-sorrel, the sensitive plant, and many other *Oxalideæ* and *Leguminosæ*, or close their flowers, as in numerous *Compositæ*. Such movements are periodic in some plants; in others, they depend simply upon exposure to or withdrawal of light. The regularity with which the opening of the flowers occurs in some commonly cultivated plants was the basis of what was tabulated by Linnæus as a 'floral clock.'

Sles'vig (Dan.), or **Schles'wig** (Ger.), capital of the Prussian province of S.-Holstein, and of the district of S., consists of a single street about 3½ miles long, extending round the W. end of the arm of the sea called the Schlei. Of the three churches of S. the finest is the Gothic Dom, dating from the 12th c., and completed in 1260, with a fine altar-piece (1521) of carved oak, representing the history of the passion in 14 sections. The old ducal castle of *Gottorp* is now used for government offices. S. has a gymnasium, and asylums for deaf mutes and for the insane. The industries are pottery, sugar-refining, and the manufacture of cambric, lace, and woollens. Pop. (1874) 14,546. At S., anciently called *Hedeby,* Ansgar (q. v.) began his work (827), and the first Christian church in Denmark was erected in 850.

Sles'vig-Holstein, since 1866 a province of Prussia, bounded N. by Denmark, E. by the Baltic, W. by the North Sea, and separated S. from Hannover by the Elbe. Area, 8524 sq. miles; pop. (1875) 1,074,085.—**Slesvig,** the northern part of the province, was formerly a duchy known until the 14th c. as S. Jutland, and belonging to Denmark previous to 1864. It was bounded N. by Jutland, E. by the Baltic and the Little Belt, W. by the North Sea, and separated on the S. from Holstein by the Eider and the Kiel Canal. Area, 3529 sq. miles; pop. (at its annexation in 1864) 406,486. S. was Danish in Karoling times; the Eider being, as Eginhard tells us, the boundary between Saxonia Transalbiana (Holstein) and the Terra Nortmannorum (wherein lay the town of Sliesthorp), inhabited by the Scandinavian heathen. Conquered, in common with all Jutland, by Otto the Great, it remained a markgrafdom of the empire until the time of Konrad II., who made the Eider again the boundary, yielding up all his claims on S. to the Danish king, Knud, in 1027. In 1232 King Valdemar II., dividing his dominions among his three sons, gave S. as a fief to Abel, whose family intermarried with that of the Counts of Holstein, and borrowed their aid in feuds with Denmark. The family of Abel having died out in 1375, S. returned to Denmark, but was in 1386 given in fief to Gerhard, Duke of Holstein, whose family having become extinct in 1459, it recurred to Christian I., the founder of the House of Oldenburg, who procured his election as Duke of Holstein by promising that the two duchies should always be united under one government. His successors on the Danish throne divided from time to time the duchies among the younger sons of the royal house, thus creating a number of families, who found it their interest to intrigue with Germany, in order to secure their power. In 1721, however, all the ducal lines were expelled from S. for having plotted against Denmark during the war with Sweden, and S. was incorporated with the crown of Denmark under Frederik IV. Yet the German colonisation of S. went on, and the number of the Danish inhabitants probably somewhat declined. In 1848 the two duchies, with the connivance of Prussia, broke into revolt, but were subdued after a severe defeat at Judsted, July 25, 1850. On the death of Frederik VII. in 1863 and the extinction of the direct Oldenburg line, Prince Augustenborg refused to recognise the claims of the new king, Christian IX., to the duchies, and, styling himself Frederik VIII. of S.-Holstein, revived a claim which had been set aside in consequence of a money payment in 1848. He was recognised by the Holsteiners, but the Austrians and Prussians seizing the opportunity to interfere, invaded Holstein, and after a gallant struggle of ten weeks the Danes were compelled to yield S., Holstein, and Lauenburg, October 30, 1864. By the convention of Gastein (August 14, 1865) Austria occupied Holstein, Prussia S.; but in consequence of the war between the two powers, and the Treaty of Prague (August 23, 1866), both duchies are retained by Prussia, and have been formed into a province of the empire. The Provincial Assembly for the Duchies of S. and Holstein having (August 4, 1878) voted an address to the German Emperor on the occasion of the attack upon his life, the members representing North S. and the island

of Alsen protested, on the ground that, by Article V. of the Treaty of Prague, the northern Danish-speaking part of S. was to be restored to Denmark, a provision which had not been carried out by Prussia.

Slick'ensides, a technical term applied to the smoothed and polished sides of two contiguous faces of rock when their relative positions have been altered by a 'fault.' The glazed appearance often shown in such cases is probably due to the action of heat and the presence of gases.

Sli'ding-Rule, a mathematical instrument consisting of two graduated scales, one of which slides over the other. The graduations are logarithmic, and by its means calculations involving multiplication and division of numbers are greatly facilitated. It is used chiefly in gauging and in mensuration of timber.

Sli'go, a maritime county of Ireland, province of Connaught, is bounded N. by the Atlantic and the Bay of Donegal and landwards by Roscommon, Leitrim, and Mayo. Area, 461,796 acres; pop. (1871) 115,493, of whom 104,242 were Roman Catholics. The coast is rocky and much indented, the chief inlet being S. Bay, and the principal headlands, Ballyconnel and Lenadoon Point. The surface is mountainous in the S.W. and N.E., and there are large tracts of bog, while the only navigable rivers are the Moy, Owenmore, and Garrogue. The small Loughs Arrow, Gill, and Gara are singularly picturesque. In the southern part of S. there are extensive tracts of corn-land and pasture. In 1874 the valuation was £211,574, and in 1876 there were 88,308 acres under corn crops, 236,081 in grass, 6612 in woods, and the remainder in waste, bog, and water. The live stock comprised in the same year 99,899 cattle, 60,471 sheep, 22,568 pigs, 7041 horses, 7774 asses, 3410 goats, and 338,817 poultry. S. also yields some minerals (copper, lead, iron, and manganese), and has valuable coast fisheries. S. was anciently the seat of the O'Connors, and contains many Celtic remains. It sends two members to Parliament.

Sli'go, the chief town of County S., on the left bank of the Garrogue (called *Sligeach*, 'shelly water,' whence the name S.), 131 miles N.W. of Dublin by a branch of the Midland Great Western Railway. The chief industries are fishing (in 1878 employing 2884 persons), flour-milling, brewing, and distilling. In 1877 there entered 470 vessels of 81,674 tons, and cleared 453 of 63,989 tons. The imports amounted to £279,645, the customs to £17,394, the exports to £2215; and on December 31 of the same year 27 vessels of 2884 tons were registered as belonging to S., besides 444 fishing-boats. The Garrogue, here crossed by two bridges, is navigable to Lough Gill. The erection of a Roman Catholic cathedral, the see of Elphin, was begun in 1867. S. publishes three weekly newspapers, and till 1870 returned one member to Parliament. Pop. (1871) 9340, showing a decrease since 1861 of 4021. S. grew up around a Dominican abbey founded by the Earl of Kildare in the 13th c., and received its charter from James I. In the vicinity is the Giant's Grave, marked by a stone circle similar to that of Stonehenge.

Sling, a primitive weapon consisting of a leather or platted socket with two long cords attached for throwing stones or other missiles. The ends of the cords are grasped in the hand and the socket containing the missile is whirled rapidly round till a great velocity is attained; one of the cords is then suddenly slipped, and the missile flies off with great force. The S. was commonly used in ancient and mediæval times, and so late as the 16th c. it and an improved weapon called the 'staff S.' were employed to hurl grenades. The inhabitants of the Balearic Islands were formerly skilled slingers.

Slip, in a dockyard, is an inclined plane, down which a vessel which has been built or has been getting repaired is run into the water. A repairing S. is furnished with a cradle which is run under the ship as it floats at high tide, and is drawn up when, after the ebb of the tide, the vessel is stranded upon it.

Sloane, Sir Hans, physician and naturalist, was born of Scotch parentage at Killyleagh, County Down, Ireland, April 16, 1660. Scientific study early proved attractive to him, and after studying medicine for some years in London he repaired to Paris in 1683. In 1684 he settled as a physician in London, became a Fellow of the Royal Society in 1685 and of the College of Physicians in 1687. This same year he accompanied the Duke of Albemarle to Jamaica, where he made a large collection of plants, but where he was unable to stay more than fifteen months, on account of the death of his patron, who was governor of the island. On his return to London in 1689 he entered upon a successful practice. In 1693 he was elected secretary and in 1702 became one of the vice-presidents of the Royal Society. The French Academy of Sciences made him a foreign associate in 1708, and George I. created him a baronet in 1716. He was president of the College of Physicians from 1719 to 1735, and succeeded Newton as president of the Royal Society in 1727. He died January 11, 1752, at his seat at Chelsea. S. was a man of fine character and genuine benevolence, as well as a distinguished savant. His museum, which contained 300 volumes of dried plants and 30,600 other objects of natural history, together with his library of 50,000 volumes and 3566 manuscripts, was bought by Government, and formed the nucleus of the British Museum. His chief work was *The Natural History of Jamaica* (2 vols. 1707–27), besides which he wrote several pamphlets, and contributed many papers to the Philosophical Transactions.

Slobodskoi', a town of Russia, government of Viatka, on the river Viatka, and 23 miles E.N.E. of the town of that name. S. has twelve churches, manufactures soap and leather, and trades in corn. The district in 1875 manufactured iron-wares to the value of £375,000. Pop. (*St. Petersb. Cal.*, 1878) 7198.

Sloe or **Sloe-Thorn** (*Prunus spinosa*) is a rigid, much-branched shrub of 3 to 8 feet high, with usually spinous branches, and possesses a very hard, tough wood. It blossoms before the leaves are developed, and by its early white flowers is one of the first plants to announce the spring. The fruit is a small dark-purple drupe, of a very austere taste, but can be made into a palatable preserve. From the tendency of the S. to throw out suckers it is more adapted for field hedges than for those of gardens; it makes an impenetrable fence. The leaves of the S. have been used to adulterate tea, the fruit to manufacture fictitious port-wine, the bark as a febrifuge, and the juice of the unripe fruit as a dye. The S. is abundant in Britain and most parts of Europe. *P. spinosa* is now united with the Bullace (q. v.), the Plum (q. v.), and some Eastern allies, as one variable species under the name *P. communis* of Hudson.

Slonim, a town of Russia, government of Grodno, on an affluent of the Niemen, 115 miles S. of Wilna, has manufactures of cloth, and a pop. (*St. Petersb. Cal.*, 1878), of 11,596.

Sloop, a vessel with one mast rigged fore and aft, usually with a boom mainsail, foresail, gaff-topsail, jib and jib topsail. It differs from a cutter in having a fixed bowsprit and a jib-stay. War vessels of about 2000 tons carrying 12 to 22 guns are denominated sloops.

Sloth, the name given to various species of *Edentate* quadrupeds, forming the family *Bradypodidæ*. In this group no incisor teeth are developed, and the molars are simple. The stomach is of complex structure. The fore limbs exceed the hind limbs in length, and the bones of the fore-arm are exceedingly mobile. The feet are normally club-footed, the animals walking upon the dorsal surfaces of the feet, a disposition of parts which renders their gait on the ground exceedingly awkward, but adapts them admirably for a life among trees; to which they climb and adhere back downwards. Of the S., the best known is the Ai or Three-toed S. (*Bradypus tridactylus*), which has three toes to each foot. Sixteen pairs of ribs exist, and the molars are destitute of roots. The Unau or *Cholœpus didactylus* is the Two-toed S. Sloths feed on the foliage of trees, and are strictly S. American in their distribution.

Slott'ing Machine', a kind of planing machine employed for cutting slots in metal. A cutting tool descends vertically with a slow motion, pares the metal, and returns with a quick movement. The work rests on a feed table, to which circular and transverse motions are communicated automatically or by hand.

Slough, a market-town of Buckinghamshire, England, 2½ miles N.N.E. of Windsor by rail. Its parish church, built about forty years since in Transition style, was enlarged (1876–78) by the addition of a chancel, transepts, &c.; and a spire is hereafter to

be erected in memory of Herschel (q. v.), whose telescope occupied the site of the present tower. The British Orphan Asylum (1863) had 158 inmates in 1871. Pop. (1871) 4509.

Slovacki, Julius, a Polish poet, son of a professor in the University of Wilna, was born there, August 23, 1809, and after completing his studies threw himself, as a soldier and a poet, into the popular war of 1830. On its failure he went abroad; and, after travelling through the East and various parts of Europe, settled at Paris. He died at Rome, April 3, 1849. Most of S.'s poems depict the darker sides of human life and character. There was something demoniac in his genius, which drove him, like Mickiewicz, after a long struggle, into the mystic religio-political sect of Towianski. His chief works are the epic poems *Zmija*, *Jan Bielecki*, *Hugo*, *Mnich*, *Arab*, *Lambro*, *Anhelli*, *Trzy poemata*, *Poema o piekle*, *Beniowski*; lyrics, *Gröb Agamemnona* and many war songs; dramas, *Kordjan*, *Mindowe*, *Maria Stuart*, *Balladina*, *Lilla Weneda*, *Mazeppa*, &c. A collection of his poems, entitled *Pisma*, appeared thirteen years after his death (4 vols. Leip. 1862). See his life by Malecki (2 vols. Lemb. 1867).

Slovaks' form, with the Poles, Czechs, and Lusatian Wends, the western branch of the Slavic family, and are chiefly found in Northern Hungary and Moravia, but are also scattered through Lower Austria, Slavonia, and the Bukovina. Their total number in the Austro-Hungarian monarchy was estimated (1877) at 4,000,000, three-fourths of whom are Catholics. Their language is closely akin to Czech, by which, under Hussite influences, it was almost superseded, till in the present century Kollar (q. v.), Palkovitsch, Holly, and other writers revived it as a literary speech. Under native princes the S. fought with the Czechs against the Avars, and in the 9th c. they formed with Moravia an independent kingdom; but the battle of Pressburg (907) rendered them subject to the Magyars, and they are now a simple race of agriculturists and woodcutters.

Slow Match consists of slightly twisted hemp which has been boiled in an aqueous solution of a salt, and dried. The fibres are thereby coated with minute saline particles, which retard combustion. English S. M. is prepared with carbonate of potash, and burns at the rate of one yard in eight hours. In France acetate of lead is employed, and the hemp treated with it burns slightly faster than English S. M.

Slubb'ing. See SPINNING.

Slug (*Limax*), a genus of *Pulmoniferous* or land *Gasteropods* (q. v.), destitute of a shell in the adult state. They have four tentacles, the eyes being borne on the tips of the larger pair. Slugs are well known as destructive visitants of gardens. They lie dormant in winter. Their eggs are deposited in clusters among the grass. Of the slugs the most familiar are the Black S. (*L. ater*); the Grey S. (*L. agrestis*); the Great Grey S. (*L. antiquorum*); and the Red S. (*Agrion agrestis*).

Slur, in music (⁀), a curve connecting several notes of different pitch, indicating that they are to be played in a smooth blending manner. Where a similar mark (called a tie) is placed over only two notes of the same pitch, it signifies that the second note is not to be repeated, though it adds its duration to that of the first. In violin music slurred notes are played with one bow.

Smack, a small vessel with one mast, rigged like a sloop or cutter, used in the fishing or coasting trade.

Small Arms, a generic term for muskets, carbines, rifles, pistols, revolvers, and bayonets.

Small Arms Factories are Government establishments where small arms of every kind are manufactured, repaired, viewed, and served out to the various branches of the army. The principal establishment of this kind in England is the great factory at Enfield, which was remodelled on its present large scale under the superintendence of General Manley-Dixon after the outbreak of the Crimean War, and where over 1000 arms ready for use can be turned out daily if required. The arms are made on the system that the parts of one rifle will fit another, as a heap are frequently taken to pieces and thrown promiscuously together. Small arms supplied by contract are viewed at a large Government establishment at Birmingham, and the success of the Enfield factory has helped very materially to reduce the price of small arms of private manufacture. At Pimlico there is an establishment for repairs, where instruction is also given to armourer sergeants. The annual cost of these factories to the country averages nearly £200,000.

Small Debts. See COUNTY COURTS, and DEBTS, RECOVERY OF.

Small'pox, or **Vari'ola**, is an infectious fever, attended with a peculiarly characteristic eruption. It is undoubtedly one of the most ancient and dreaded diseases with which the human race has been afflicted. Epidemics of S. are referred to in the most ancient Chinese and Indian books; and by the former, among whom it is known as the 'bean disease,' it is traced to the reign of the first emperor of the (eastern) Han dynasty, Kwang Wu, who reigned A.D. 25-28, and is said to have been imported from Central Asia or from South-Western China. According to some authorities, however, the disease has been known in China only since about the end of the 9th c. of our era. The earliest Chinese work on S. was published in 1323, and from it we learn that inoculation has been known and practised in China since the Sung dynasty (A.D. 960-1127). According to the Chinese, the poison is communicated from the parents to the fœtus; and all, therefore, possess the germ in their constitutions, waiting only for the appearance of circumstances favourable to its development. The exact period of the introduction of S. into Europe is unknown; but it is almost certain that the Arabian army was attacked by it at the siege of Mecca in A.D. 569, and it is known to have visited both France and Italy in 570. In the 8th c. all Europe was infected with it, the dissemination being probably due to the Saracens. The first accurate description of the disease is that of Rhazes, an Arabian physician, who flourished early in the 10th c. S. probably reached England towards the close of the 9th c. In 1517 it was carried from Europe to St. Domingo. Three years later, it reached Mexico, and thereafter spread with intense virulence throughout the New World. It was estimated that in Mexico alone three and a half millions of people fell victims to the disease. In 1707 S. was introduced into Iceland, and in 1733 into Greenland, where it almost depopulated the country.

The history of S. in England may be divided into three periods, the first period extending from its introduction to 1721, during which its ravages were altogether unchecked; the second, from 1721 to 1802, during which it was somewhat checked by inoculation; and the third, from 1802 till the present time, the period during which vaccination has been in operation. During the first period, S. was the most fatal of all the contagious diseases, and the annual mortality in Europe was estimated at 494,000. During the second period, that of inoculation, the mortality from natural S. was 1 in 5; in inoculated S., first 1 in 50, and afterwards, when greater care was taken, and more skilful operations possible, 1 in 500. Dr. Wynter Blyth says—'Dividing the last forty unvaccinated years of the 18th c. into four decades, and taking six decades of the vaccinated 19th c. up to 1860, by calculating out the ratio of deaths from S. to deaths from all causes, we get the following remarkable series: For the four unvaccinated decades, 108, 98, 87, 88; for the six vaccinated decades, 64, 42, 32, 23, 16, 11.' In the latter part of 1870 S. began to increase in this country, and in 1871 and 1872 it attained alarming proportions. It raged also in Paris, Vienna, Holland, America, and other places; but it was observed that in all cases the thoroughly vaccinated took the disease but lightly or not at all, and that those who had been but imperfectly vaccinated, or not at all, suffered most severely and fatally.

S. is essentially an infectious or contagious disease, the contagium being conveyed in minute particles of living matter proceeding from a pustule. When the *materies morbi* enters the circulation of an unprotected subject it multiplies within the body, and eventually causes high fever followed by the breaking out of little pimples, each of a peculiar oval shape and with a central depression. When the pustules are solitary and apart from each other the disease is called *discrete*, but when they are so thick that they run into one another, there being no space between, it is then called *confluent*.

S. in its course may be divided into four stages: (1) the period of incubation; (2) the febrile stage; (3) the exudative stage; and (4) the suppurative stage. The first period is non-infectious; the second may be infectious, but it is not certainly so; the third and fourth are most certainly infectious. The period of *incuba-*

tion, in ordinary S., is between thirteen and fourteen days, so that persons coming from an infected district cannot be pronounced safe until about eighteen days have elapsed. In inoculated S. the stage of incubation is generally from seven to nine days. The *second*, or *febrile stage*, in discrete S., lasts four days and then the eruption appears; but in confluent S. the eruption appears at the end of the third day, or even on the second. This stage is characterised by rigors, a hot and dry skin, quick pulse, furred tongue, pain in the stomach, nausea, vomiting, headache, and pain in the back and limbs. In children there are frequently convulsions, and in adults delirium. On the third day small red specks appear in the following order, viz.; (1) on the face; (2) on the neck and wrists; (3) on the trunk; and (4) on the lower extremities. As the eruption extends the febrile symptoms decline. The *third stage*, or *exudative stage*, commences when the eruption is fully out. The eruption, at first a pimple, then a vesicle, and afterwards a pustule, is generally at its height on the eighth day from the commencement of the fever. The pustules are at first depressed in the centre, but by the fifth day they become turgid and hemispherical. The pustules then break and scabs form over them, which fall about the thirteenth or fourteenth day of the disease, though sometimes longer. The severity of the case is in proportion to the number of the pustules. There is usually swelling of the skin of the face, and often of the scalp, soreness of the mouth and salivation, and the patient exhales a peculiar and disagreeable odour. About the eighth or ninth day from the beginning of the febrile stage there is a recurrence of the fever, known as 'the fever of maturation.' The scabs are usually completely gone by the twenty-first day, leaving behind them reddish-brown blotches which sometimes continue for several months, and some of the pustules, in consequence of ulceration of the true skin, leave marks, commonly called pock-pits, more especially on the face. The most dangerous period is that of suppuration, more especially if the disease be confluent. In ordinary cases of S., the incubation period lasts a fortnight, and the illness itself another fortnight.

S. may be communicated by direct contact, by emanations from the sick, by insects, and by articles of clothing, books, letters, &c., and the contagion may remain dormant, as in clothing or buildings, for an indefinite number of years. Regarding the *prevention* of S., Dr. Wynter Blyth says:—'First among the preventive means stands *effective vaccination*. By effective vaccination is meant *four large* distinct vaccine vesicles inoculated on the arm of every child under three months; a second vaccination, which may or may not take effect, at the age of ten or twelve; and a third vaccination in another ten or twelve years. Besides these, on the approach of S., every individual should be *tested*, by vaccine, whether he or she is susceptible of S. When S. actually appears, every case, however mild, must first be isolated as much as possible. Thin curtains should be fixed to the open windows, so as to allow no flies to go out and in, and fly-catchers should be suspended in different parts of the room. The patient's body should be well anointed with carbolic acid oil, the excreta received in vessels containing some disinfectant, and buried deep in the ground. The attendants should be thoroughly vaccinated, and all cloths, rags, &c. used to wipe discharges from the mouth should be burnt. If the patient recovers, he must not be allowed to go out until all desquamation ceases, which will be in about a week after the scabs drop off: and before going out he should have a thorough change of clothing; the skin should be rubbed over with oil and then washed. If the case should be fatal, a coffin should be prepared lined with chloride of lime; the body should be laid out only by some one who is protected by vaccination or a previous attack, and it should be covered with disinfectants. Burial as soon as possible is very desirable, and no one should follow the coffin who has not been re-vaccinated.'

Smalt, a beautiful blue pulverised glass prepared by fusing cobalt ore with potash and quartz. It is used for making blue glass, in colouring porcelain, earthenware, paperhangings, &c., and tinting linen, calicoes, and paper. Saxony produces considerable quantities of S.

Smart-Money, a fine of 20s. paid by a recruit desiring to free himself from his enlistment contract. See RECRUITING.

Smea'ton, John, the designer of the Eddystone Lighthouse, was born May 28, 1724, at Austhorpe, near Leeds. His father was an attorney, and sent his son to London in 1742 to study law; but this he was permitted to give up for the more congenial study of mechanical and engineering science. In 1750 he began business as a mathematical instrument maker, made various improvements in hydraulic machinery, and obtained the Copley medal of the Royal Society in 1759 for his improvements in millwork. In 1753 he became a member of the Royal Society, and, recommended by the president, the Earl of Macclesfield, was intrusted in 1756 with the re-erection of the Eddystone Lighthouse, which had been destroyed by fire the previous December. The cutting of the rock for the foundation was begun on August 5, 1756; the first stone was laid on June 12, 1757; and the lantern was first lighted on October 16 of the same year. In 1764 he obtained the post of receiver of the Derwentwater estate, which he resigned in 1777 in consequence of increased professional duties. His other chief engineering works were the construction of the Ramsgate harbour (1774), the laying out of the Forth and Clyde Canal, the rendering of the Calder in Yorkshire navigable, the construction of Spurn Lighthouse at the mouth of the Humber, besides many important bridges in Scotland. Towards the close of this useful career he published an account of the Eddystone Lighthouse (1791), and at his death, which occurred at Austhorpe, October 28, 1792, was engaged upon a *Treatise on Mills*, which was never published. He was also the author of valuable *Reports* before the Society of Civil Engineers, of which he was one of the chief promoters. For the greater portion of his life he was the general adviser on engineering matters to Parliament, being undoubtedly the greatest authority of his time upon such professional questions. His *Reports*, published by the Society in 1812, were accompanied with a biography of S.

Smectym'nuus, an answer to Bishop Hall's *Divine Right of Episcopacy*, was published at London in 1641, and was so entitled because the joint work of five Presbyterian divines—Stephen Marshall, Edmund Calamy, Thomas Young, Matthew Newcomen, and William Spurstow.

Smell. See NOSE.

Smelt (*Osmerus eperlanus*), a species of *Teleostean* fish belonging to the Salmonidæ (q. v.), and inhabiting both sea and lake. The average length is about 4 or 5 inches. The body is long and compressed, and the eyes are large. The colours are brilliant and iridescent. A strong violet odour is said to be exhaled from the S. As a food fish it is considered a delicacy. An allied species is the American S. (*O. irridescens*), which may attain a length of 10 inches. The back has a green lustre. The common S. is often named the *Spirling* and *Sparling* in Scotland. The term Land S. is applied to the *Atherina presbyter*, a near relation of the Mullet (q. v.). This fish attains a length of 6 inches, and is plentiful on the British coasts.

Smelt'ing is the metallurgical process by which ores are, in furnaces of various kinds, reduced to their metallic condition. (See IRON and METALLURGY.)

Smew (*Mergellus albidas*), a species of swimming-bird common on the coasts of Britain, and also found inland. The bill is broad and hooked at its tip. Its average length is 17 inches, the female bird being smaller. The male is white on the head, neck, and chin, the back being blackish grey. The head has a crest. The female is reddish brown marked with grey. The eggs are brown, and number eight or ten.

Smila'ceæ is a natural order of monocotyledonous herbs or undershrubs, often climbers, with net-vined leaves, and a small berry for fruit. By the best modern systematists it is now included in *Liliaceæ*. In addition to the species of *Smilax* furnishing Sarsaparilla (q. v.) and China root, others supply evidence of the widely recognised value of the genus in medicine, thus—*S. ovalifolia* and *S. lanceæfolia* are used in India, *S. glyciphylla* in Australia, *S. Macabucha* for dysentery in the Philippines; and *S. anceps* in the Mauritius. In the eastern United States and Canada there is an immense local use of the roots of *S. rotundifolia* for the bowls of tobacco-pipes; it is estimated that nearly three millions of these 'briar-root' pipes are now manufactured annually.

Smiles, Samuel, the historian of industrial enterprise, was born at Haddington, Scotland, in 1816, educated for the medical profession, and practised for some time at Leeds, where he published *Physical Education* (1837) and a work on *Railway*

Property, its Conditions and Prospects (1849). After holding the editorship of the *Leeds Mercury*, he became secretary to the Leeds and Thirsk Railway in 1845, and transferred his services about 1852 to the South-Eastern Railway, from which he retired in 1866. His principal works are—*Life of George Stephenson* (1859); *Self Help* (1860); *Workmen's Earnings; Strikes and Wages* (1861); *Lives of the Engineers* (4 vols. 1862; new ed. 5 vols. 1875); *Industrial Biography* (1863); *Lives of Boulton and Watt* (1865); *The Huguenots; their Settlements, Churches, and Industries in England and Ireland* (1867); *Character* (1871); *The Huguenots in France after the Revocation of the Edict of Nantes* (1874); *Thrift* (1875); *Life of a Scotch Naturalist* (Robert Edwards; 1876), and *George Moore, Merchant and Philanthropist* (1878). These works, written in a simple, attractive style, are a mine of information on matters relating to trade and industry. They are characterised by a high moral tone, and a sound knowledge of the workings of economic science. Many of them have been translated into various European languages, *e.g.*, a Spanish ed. of *Self Help* appeared in 1878. S. received the degree of LL.D. from Edinburgh University in 1878.

Smith, Adam, born at Kirkcaldy, 5th June 1723, was the posthumous son of a comptroller of customs. He received a rudimentary education in his native town, and in 1737 passed to the University of Glasgow, which he left three years later with the Snell Exhibition for Balliol College, Oxford. Oxford was then at its worst, and S. gained little from its teachers. These even to some extent debarred him from private study, and reprimanded him for reading Hume's essays; yet he spent seven years at Oxford, and returned with a good store of Greek, of which few of his Scotch contemporaries possessed more than a smattering. He then abandoned the intention once entertained of entering the Church, and after a period of study began to lecture on rhetoric in Edinburgh in 1748, under the patronage of Lord Kames. In 1751 he was appointed Professor of Logic in Glasgow College, and in 1752 Professor of Moral Philosophy. The thirteen years here spent, S. ever after talked of as the happiest in his life. His lectures drew large bodies of students, and took so wide a sweep as to include a history of 'the general principles of law and government, and of the different revolutions which they have undergone in the different ages and periods of society.' Much of the matter of these lectures was embodied in his *Theory of Moral Sentiments* (1759), the first of his writings, with the exception of two unimportant review articles. This *Theory* attempted to account for morals without so imperious and strange a monitor as conscience, and founded all on sympathy. According to S., we do not approve or disapprove actions because we know the intentions of the agent and the consequences of such actions. Before we reach moral judgment, a further process is gone through: we picture to ourselves the feelings of the agent along with those of the persons whom his actions affect. If we feel in sympathy with the supposed motives of the agent, and with the responsive state of mind—say, gratitude—which he calls up in those affected, only then do we accord approval. In regard to our own conduct, by a still more complicated act of imagination we contemplate others sympathising with us, or dissenting from us; and according as we in turn agree with their sympathy or their dissent do we judge ourselves. Whatever its philosophic value, this book was remarkable in an age of slipshod English for beauty and richness of illustration, and a style in the literature of philosophy only second to Berkeley's. In March 1764, S., having resigned his professorship, set out for the Continent as tutor to the young Duke of Buccleuch, and after a prolonged tour through France and Switzerland, he and his charge settled in Paris for nearly the whole of 1766. There, amid many notables, he met Quesnay, the man who most of all influenced his economic views. On his return, the duke settled on S. an annuity of £300 a year. In the end of 1766 he was once more at Kirkcaldy, where he remained in studious seclusion engaged on his great work, the *Inquiry into the Nature and Causes of the Wealth of Nations* (1776; supp. 1784). During these ten years Hume had been accusing his friend of idleness; but immediately on the publication of the *Wealth of Nations* he was able to write to Kirkcaldy that it was everywhere talked of. In a year or two it had worked a very considerable part of the revolution in economics that is due to it. Its influence is dealt with in the article POLITICAL ECONOMY. Suffice it here to say that its chief characteristic was the transference of attention from material wealth, considered as wealth, and considered as the object of labour, to labour itself, as the measure of wealth. This standard, however, S. does not consistently maintain. For two years after the publication of his book he resided in London; and in 1778 he returned to Edinburgh as a commissioner of customs. No more ridiculous commissioner of customs could have been found, for he was an absent-minded man, utterly devoid of business habits, as many curious stories attest. In 1787 the shy scholar was chosen Lord Rector of the University of Glasgow. Amid a circle of chosen friends, such as Stewart and Robertson, he passed serenely into old age; but the deaths of his mother and his cousin broke his health, and his life of beneficence ended July 17, 1790. Two pieces of S.'s seldom mentioned are *The Rights of Great Britain asserted against the Claims of America* (Glasg. 1776), and his *Letter to Mr. Strahan on the Last Illness of David Hume* (Lond. 1777). His posthumous *Essays on Philosophical Subjects* were edited by Black and Hutton in 1795. The best edition of the *Wealth of Nations* is that of M'Culloch (1839). The French have a very accurate translation of the *Wealth of Nations* by Garnier, with the notes of Buchanan, Garnier, M'Culloch, Malthus, Mill, Ricardo, Sismondi, J. B. Say, and Blanqui. See Dugald Stewart's *Account of A. S. and his Writings*, prefixed to the complete edition of his works (5 vols. Edinb. 1812); M'Culloch's *Sketch of the Life and Writings of A. S.* (*ib.* 1855); Von Inama-Sternegg's *A. S. und die Bedeutung seines Wealth of Nations für die Moderne Nationalsökonomie* (Innsbruck 1876), and Oncken's *A. S. und Immanuel Kant* (Leip. 1877).

Smith, Alexander, was born at Kilmarnock, Ayrshire, 31st December 1830. There, at Paisley, and at Glasgow he passed his childhood, and, destined for the ministry, received the usual Scottish schooling; but circumstances forbade his entrance at the university, and while still a boy he took up his father's calling of pattern-designer to a Glasgow firm. He wrote, like threescore comrades, boyish verses, but, unlike them, chose for his models Keats, Wordsworth, Tennyson, rather than Burns and Tannahill; the merit of some of his pieces was recognised by the late George Gilfillan, and through him they found their way into London journals, where Herbert Spencer noticed and praised them. This partly paved the way for the ovation that greeted his *Life Drama, and Other Poems* (1853), which sold by thousands, drew forth an article in the *Revue des deux Mondes*, and earned their author the post of secretary to Edinburgh University (1854). At Edinburgh, amongst new friends, he met Sydney Dobell (q. v.), with whom he produced *War Sonnets* (1855); two years later appeared his *City Poems*, which critics of the baser sort, ashamed of their late furore, united to assail, though it contains his finest, most artistic, and most original work. There were 'stars' in Milton, and 'stars' in *The City Poems*, the plagiarism was glaring; both here and in *The Life Drama* allusions to Cleopatra—fie on such poor invention! The Northumbrian epic, *Edwin of Deira* (1861) fared only better in that it passed unheeded, and from poetry S. turned to half-poetic prose, in 1863 publishing some collected essays under the title *Dreamthorp*, and in 1865 *A Summer in Skye*, where fancies are piled as high, sometimes as beautiful, as the island rocks themselves. Last came the simple, touching tale, *Alfred Hagart's Household* (1866), with its memories of the writer's early home, touching because on 8th January 1867 the writer died at Wardie in his thirty-seventh year. He belonged, of course, to the 'Spasmodic School,' and it is ill pleading for a criminal gibbeted by an evil name; yet 'purple patches' of the rarest beauty are not unfrequent in his half-forgotten poems. See Brisbane's *Early Years of Alexander S.* (Lond. 1869) and the Memoir by Alexander prefixed to S.'s *Last Leaves* (Lond. 1869).

Smith, George, the Assyriologist, was born at Chelsea, March 26, 1840, and taking an early interest in Assyrian researches, commenced in 1857 the study of Accadian. He was appointed Keeper of Antiquities at the British Museum (1865), on the recommendation of Sir Henry Rawlinson, whom he helped in the third volume of his *Cuneiform Inscriptions of Western Asia* (1867), and himself published in 1871 a masterly handbook on the *Phonetic Value of the Cuneiform Syllabary* and a *History of Assur-bani-pal*, in which 3000 lines of inscriptions in the British Museum relating to Sardanapalus are transcribed, transliterated, and translated. His discovery (1872) of a tablet containing the

Chaldean account of the Deluge awakened general interest, and the proprietors of the *Daily Telegraph* advanced £1000 towards the expenses of excavations on the site of Nineveh. Accordingly in January 1873 he quitted England, reached Mosul in March, and having made important excavations at Kouyunjik and paid a flying visit to the sites of Babylon and other buried cities, returned to England in the following autumn. Next year a second expedition, undertaken this time on behalf of the British Museum, was interrupted by the expiry of his *firman*, which the Turkish authorities refused to renew. However, in these two expeditions, with barely four months' actual work, he had fixed the date (860 B.C.) of the S.E. palace at Nimrûd, discovered a fragment of a crystal throne, a *stylus*, marble lintel, &c., and secured for the nation nearly 3000 tablets, described in his *Assyrian Discoveries* (1875). In March 1876 he started once more for the East, and during a stay in Syria established the site of Carchemish, the Hittite capital, at the modern Jerablûs (Gr. *Hierapolis*). The plague-stricken and unsettled state of the country stood in the way of excavations, and he was on his homeward way when he died at Aleppo, August 19, 1876. His works further include *The Assyrian Eponym Canon* (1875), *Ancient History from the Monuments—Assyria* (1875), *The Chaldean Account of Genesis* (1876), and the posthumous *Ancient History of Babylonia from the Monuments* (1877), and *History of Sennacherib* (1878), both edited by Mr. A. H. Sayce.

Smith, Gerrit, an American philanthropist, was born in Utica, New York, 6th March 1797. He inherited large landed estates from his father, an old partner with J. J. Astor (q. v.) in the fur-trade. He gifted away nearly the whole of his property to negroes—as much as from 40 to 60 acres of freehold to 3000 persons in the single year 1846. He was an eccentric advocate of vegetarian diet and teetotalism, and in a literal sense kept an open 'tavernous' house. His charities were estimated at £10,000 a year. He contributed largely to the expenses of the Civil War in the interest of the Union, but joined Horace Greeley in signing the bail-bond of Jefferson Davis in 1867. His published works are *Speeches in Congress* (1855), *Sermons and Speeches* (1861), *The Theologies* (1866), &c. S. died in New York city, 28th December 1874. See his *Life* by O. B. Frothingham (New York 1878).

Smith, Goldwin, LL.D., born at Reading, August 13, 1823, passed from Eton to Oxford, where he gained a Magdalen demyship, the Ireland and Hertford scholarships, and the Chancellor's prize for Latin verse. Having taken his B.A. (1845), he was elected Fellow of University College, in 1847 was called to the bar at Lincoln's Inn, served as secretary to two university commissions, and was a member of the Education Commission (1859–60). He held the regius professorship of modern history (1858–66), during the American Civil War supported the Federal cause in various pamphlets, and having made a lecturing tour through the United States in 1864, published on his return a lecture *On England and America* (1865), and *The Civil War in America* (1866). In 1868 he accepted a call to the chair of English History in Cornell University, but resigning in 1871 removed to Toronto, where he became a member of the University Senate, and edited the *Canadian Monthly* (1872–74). In the spring of 1877 he was pursuing historical investigations at Rome, on the conclusion of which he spent some months in London, having in the previous year been elected an honorary member of the Reform Club. Amongst his writings—keen, eloquent expressions of ultra-liberal thought—are *Lectures on Modern History* (1861), *Irish History and Irish Character* (1861), *The Empire: a Series of Letters* (1863), *Speeches and Letters on the Rebellion* (2 vols. New York 1865), *Three English Statesmen: Pym, Cromwell, and Pitt* (1867), and *A Short History of England down to the Reformation* (1869).

Smith, James and Horace, princes of parody, were born in London, the former 10th February 1775, the latter 31st December 1779. James, articled to his father, became his partner, and succeeded him as Solicitor to the Board of Ordnance, dying in London, 24th September 1839; while Horace, making a fortune on the Stock Exchange, retired to Brighton, and died at Tunbridge Wells, 12th July 1849. Both had contributed to the *Pic-Nic* (1802), the *Mirror* (1807–10), and other journals, when an advertisement in 1812 offering a prize of £20 for an address to be spoken at the reopening of Drury Lane, suggested the notion of a series of *Rejected Addresses*, supposed to be written by the great poets of the day. Within six weeks a little volume, first literally rejected by Murray, was published by Miller on the condition that the brothers were to receive one-half the profits, if any: in seven years' time it reached its sixteenth edition, and Murray was glad to buy the copyright. Of its nineteen parodies eight were by James, besides the first stanza of that on Byron; but which of the brothers bears away the palm it is hard to say, since James's 'Crabbe' is 'admirably done,' to use Crabbe's words, whilst Horace's 'Scott' called from Sir Walter the remark: 'I must have done this myself, although I forget on what occasion.' A splendidly illustrated edition was published at New York in 1869. James also wrote eight of Charles Matthews' Entertainments, receiving for the same £1000; and Horace from 1807 to 1845 produced over twenty novels, long since forgotten, but of his *Tin Trumpet, or Heads and Tails* (1836), a new edition appeared in 1869.

Smith, John Pye, born at Sheffield, May 25, 1774, was from 1800 to 1850 successively classical tutor, divinity lecturer, and principal of the Independent College at Homerton, where he was also for forty-three years pastor of the 'Old Gravel Pits Chapel.' He died at Guildford, Surrey, February 5, 1851. S. wrote *The Scripture Testimony to the Messiah* (2 vols. 1818–21, 4th ed. 1847), *Four Discourses on the Sacrifice and Priesthood of Christ* (1828, 3d ed. 1847), *Principles of Interpretation as applied to the Prophecies of Scripture* (1829, 2d ed. 1831), and *The Relation between Holy Scripture and some parts of Geological Science* (1839, 4th ed. 1848). See J. Medway, *Memoirs of the Life and Writings of J. P. S.* (1853).

Smith, Joseph. See MORMONS.

Smith, Sydney, born at Woodford, Essex, 3d June 1768, rose to be captain of Winchester School, and after a six months' stay at Mont Villiers, Normandy, was elected first scholar, then fellow of New College, Oxford (1790). His father, a clever, eccentric man, now left him to his own resources, and these being insufficient for the Bar, he was ordained to the curacy of Netherhavon. Two years he spent upon Salisbury Plain, when the village squire engaged him to accompany his son to Weimar; but Germany was disturbed by war, and in stress of politics he put into Edinburgh (1797), his home for the next five years. There he officiated at the Episcopal chapel, married in 1799, and in 1802 founded, with Jeffrey, Brougham, and others of Edinburgh's Augustan Age, the *Edinburgh Review* (q. v.), contributing to its first number seven out of nine-and-twenty articles. Coming to London (1803), he gained the entrée of Holland House, lectured on moral philosophy at the Royal Institution (1804–06) to crowded benches, and preached to as crowded pews till 1806, when Erskine gave him the little Yorkshire living of Foston-le-Clay. Having built himself the ugliest house in all the country, he for twenty-two years was 'village parson, village doctor, village comforter, village magistrate, and Edinburgh Reviewer' at Foston, which Lyndhurst, the Tory Chancellor, enabled him to exchange for Combe Florey, Somerset (1828), at the same time giving him a Bristol stall. From the Whigs he at length received a prebend of St. Paul's (1831), and thenceforth lived chiefly in London, where he died, 22d February 1845. More by his witticisms and clever nonsense is S. remembered than by his writings, yet these were neither few nor unimportant. His own edition of his collected works (3 vols. 1839) includes *Edinburgh* essays on Education, University and Church Reform, the Game and Poor Laws, &c., *Peter Plymley's Letters* (1807), supporting Catholic Emancipation, and other tracts, none of them reaching over 50 pp. All are distinguished by strong good sense, by cogent reasoning, and infinite humour—excellences sometimes dashed by a straining at effect, misplaced if good-natured personalities, and a love of outlandish words, such as *anserous*, *holoplexia*, or *sudarium*. See the Life by his daughter, Lady Holland, with selections from his letters by Mrs. Austin (2 vols. Lond. 1855), and vol. i. of Hayward's *Biographical and Critical Essays* (Lond. 1858).

Smith, Sir Thomas, born at Saffron Walden, Essex, 1512, at fourteen entered Queen's College, Cambridge. He early distinguished himself as a Grecian, was made fellow of his college in 1531, and two years later became a public lecturer. He and his friend Cheke attacked the prevailing mode of pronouncing Greek, which differed widely from that now in use. At first strenuously opposed, S. and his colleague by patience conquered all the authorities except Gardiner, Bishop of Winchester. In 1539 S. travelled on the Continent, taking a doctor's degree at Padua;

and on his return he became professor of civil law at Cambridge. Under Edward VI. he became a secretary of state (1548), and was knighted. While his patron Somerset was in office, he was employed as ambassador to Belgium and France. At the accession of Mary he lost all honours, only retaining a pension of £100 a year; but in Elizabeth's reign he again became a secretary of state, Chancellor of the Order of the Garter, and ambassador to France. S.'s works are two inconsiderable tracts, *De Recta et Emendata Linguæ Græcæ Pronunciatione*, and *De Recta et Emendata Linguæ Anglicanæ Scriptione Dialogus* (both 1568), and the better-known *De Republica Anglorum; the Maner of Government, or Policie of the Realme of England* (1583). He died in 1577. His *Life* by Strype was reprinted by the Clarendon Press (Oxf. 1820).

Smith'field, the famous London live-cattle market, lying to the N. of Newgate and a little W. of Aldersgate, was once a place of recreation outside the city walls. Here Sir William Wallace was executed in 1305, and Wat Tyler met his death in 1381. The scene of several noted tournaments, it became in the reign of Mary the place for the execution of martyrs. Bartholomew Fair (q. v.) was held regularly at S. till 1853. S. is first mentioned as the site of a cattle-market by Fitz Stephen in 1150. The corporation acquired in 1345 the official control over the market, which they retained for upwards of five hundred years. The space devoted to the market was enlarged from 3 acres to 4½, and in 1834 to 6¼. The ancient regulations were called the 'Statutes of S.' In the later days of the market there sometimes assembled 4000 cattle and 30,000 sheep; the annual amount of the sales was £7,000,000. In 1846 there were sold 226,132 cattle, 1,593,270 sheep and lambs, 26,356 calves, and 33,531 pigs. Owing to the want of space and the vicinity of slaughterhouses, an Act was passed in 1851 appointing metropolitan commissioners with powers to provide a new market, slaughterhouses, &c., and S. was used for the last time on the 11th June 1855. The new market at Copenhagen Fields, erected from designs by Messrs Browne and Robinson at a cost of £134,460, was opened to the public 1st December 1868. The S. Club, to promote improvement in cattle-breeding, was established in 1798, and now holds its annual cattle shows in the Agricultural Hall, Islington.

Smithso'nian Institu'tion, The, an establishment for the 'increase and diffusion of knowledge among men,' was founded at Washington, United States, in 1846, with funds left for that purpose by James Lewis Macie Smithson (1765-1829), a distinguished English chemist, who was a natural son of the third Duke of Northumberland, by Elizabeth Macie, a niece of the Duke of Somerset. The institution derived altogether about £108,275 from its bequest. By its constitution the President of the United States is *ex officio* the presiding officer, and it is governed by a board of thirteen regents under him. It is in no sense a university or teaching institution, but confines itself to the encouragement of scientific research and the diffusion of its results. Besides an annual *Report*, it has published twenty-one quarto volumes of *Contributions to Knowledge*, and twelve octavo volumes of *Miscellaneous Collections*. It has established a system of exchanges of publications with 2200 foreign scientific societies, and its library of 75,000 volumes is now amalgamated with the Congress library. The building, which is in the Romanesque style of architecture, and one of the finest in the United States, was partially destroyed by fire in 1865, but has since been entirely rebuilt. Besides a lecture-hall, theatre, &c., it contains several scientific collections, among them the National Museum. See the *Report of the Board of Directors of the S. I.* (Washington and Lond. 1878).

Smoke, Consumption of. Smoke arises from the imperfect combustion of fuel, and is composed of minute particles of carbon mechanically suspended in gaseous hydrocarbons, which gases are of themselves invisible. In manufacturing centres, where much coal is consumed, the smoke therefrom when allowed to escape into the atmosphere becomes an unmitigated nuisance. In the metropolis and in Scotland, manufacturers and others are compelled by law under penalty of a fine to construct their furnaces so as to consume smoke; and where the law is stringently enforced public health and comfort are promoted, and in most instances economy of fuel is effected. A principle common to many of the numerous smoke-consuming arrangements that have been devised, is that of leading a supply of air into a 'combustion chamber' constructed behind the 'bridge' of the furnace, where the combustible gases evolved from the fuel commingle with it, and are thoroughly burned up before reaching the flues. This plan is followed in the smoke-consuming furnaces of Mr. C. W. Williams and others. 'The air must be admitted in volumes sufficient to ensure perfect combustion. If the supply be deficient, the evil intended to be remedied will be intensified with bituminous coal; while with anthracitic fuel 'the carbon will be taken up by carbonic acid forming carbonic oxide, a process which, although it consumes the soot, consumes at least one-third of the heat previously given out in the formation of the carbonic acid thus converted, and cools the fire to this extent.' Thus it is possible to get rid of the smoke at a ruinous expense of fuel. The admission of an excess of air has also the disadvantage of cooling the furnace, often below the temperature—about 800° F.—required for the ignition of the carbon contained in the gases. The *dead-plate* system is very efficient in reducing smoke to an inappreciable quantity. Instead of throwing large quantities of coal carelessly over a fire, small supplies are heaped on a plate in front, to be coked by the heat, and the gases expelled in the process pass over the incandescent fuel within, and are completely consumed. The coke is then pushed into the furnace and the dead-plate replenished. Mechanical feeders have been applied to some dead-plate furnaces. Other noteworthy contrivances are the revolving-grate furnaces of several inventors, and the ingenious self-ventilating smoke-consumer of Mr. Wright, in which a heated jet of steam is blown upon the incandescent fuel, exciting a draught and protecting the boiler-plates from the injurious action of cold air. Siemens' regenerative gas furnace is also a thorough smoke-consumer.

Smoke-Stack, a term applied to the chimney of a locomotive and to the funnel of a steam-ship as seen above deck. The funnels of war vessels are made *telescopic*, so as to be drawn down and protected during action.

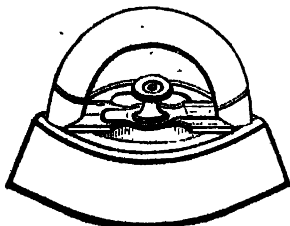
Smolensk', a government of European Russia, lying to the W. of the government of Moscow. Area 21,637 sq. miles; pop. (1876) 1,193,287. The surface is undulating and for the most part fertile. Rye is produced in large quantities, but hemp, flax, tobacco, and hops are also grown. The forests are valuable. The Dnieper and the Dwina, the former flowing into the Black Sea and the latter into the Baltic, both have their source in the government of S.—**S.**, a city of European Russia, capital of the government of the same name, on the Dnieper about 240 miles W.S.W. of Moscow by rail. It has a strong citadel, and is surrounded by walls 4½ miles long, with twenty-one Gothic towers. S. has a splendid cathedral, twenty-four churches, and three monasteries, a Cadet Academy and five schools. Manufactures of leather, silk, and soap are carried on, and there is a great grain trade. It is one of the oldest cities in Russia, being mentioned as early as the 9th c., and is said to have had at one time 200,000 inhabitants. An iron monument 84 feet high has been erected in memory of the battle fought here in 1812, in which Napoleon defeated the Russians under Barclay de Tolly and Prince Bagration. Pop. (*St. Petersb. Cal.*, 1878) 24,332.

Smoll'ett, Tobias, was born of gentle parentage at Dalquhurn House, in the Vale of Leven, March 1721. Losing his father early, and having learnt the 'rudiments' at Dumbarton school, he served a four years' apprenticeship to a Glasgow surgeon while attending the university classes, then started for London with the inevitable tragedy in his pocket (1739). The *Regicide* shared the common fate, and its author, shipping as surgeon's mate on board the *Cumberland*, was present at Vernon's vain attack on Cartagena (1741), but quitted the service at Jamaica, where he met the Creole heiress, his future wife. In 1744 we see him a feeless London surgeon, writing ill-paying satires; in 1747 he married; a twelvemonth later appeared *Roderick Random*—the story partly of his own adventures—and straightway he leapt to fame. A visit to Paris brought him across Mark Akenside and a nameless affected painter, his prototypes for two characters in *Peregrine Pickle* (1751), which published, S. settled at Bath with an Aberdonian degree of M.D. A lack of sympathy for *malades imaginaires* soon made him resume the pen, and shifting his quarters to Chelsea, he drew in *Ferdinand Count Fathom* (1753) a scamp with none of his earlier heroes' better qualities, translated *Don Quixote* (1755), started the *Critical Review* (1756), and in fourteen months

dashed off a *History of England* (4 vols. 1758), ruining his health in the attempt. The *Critical* also proved a 'perpetual fountain of hot water,' a paragraph on Admiral Knowles bringing its editor three months' imprisonment in the King's Bench, with a fine of £100 (1739). Ill-health and debt, his daughter's death, and a quarrel on Bute's behalf with his old friend Wilkes, made S. glad to leave England for a time; Sterne tells how 'Smelfungus' travelled from Boulogne to Paris, from Paris to Rome (1762-65), and in *Travels through France and Italy* described the Pantheon as a 'cockpit,' the Venus de Medici as 'awkward and hideous,' the 'Last Judgment' of Michael Angelo as a 'mere mob.' Visits to Scotland and Bath (1766-67) furnished materials for *Humphrey Clinker*, written at Monte Novo, near Leghorn, which hardly was published when S. died, 16th October 1771. With little inventiveness but keen perception, the power of drawing from life but none of designing plots, the coarseness of the age but a humour all his own, England's Le Sage produced, says Thackeray, 'the most laughable story since novel-writing first began'—*Humphrey Clinker*. It and his two first novels rank far above the rest, *Sir Launcelot Greaves* (1760) and the political *Adventures of an Atom* (1769), being wholly unworthy the creator of 'Uncle Bowling,' 'Trunnion,' and 'Crabtree,' or the inimitable 'Lieutenant Lismahago.' The *Tears of Scotland* (1746) and *Ode to Leven Water* (1776), one mourning for, one glorying in, his native land, are the best of the poems in S.'s *Miscellaneous Works* (new ed. Lond. 1878), to which a Memoir by Roscoe is prefixed. See also the Life of him in Bickers' edition of his *Complete Works* (8 vols. Lond. 1873), R. Chambers' *S.* (Edinb. 1867), and Thackeray's *English Humourists* (Lond. 1858).

Smolt. See SALMON.

Smoothing-Irons are domestic implements of iron or steel with a flat face for smoothing linen, &c. There are many varieties which mainly differ in the modes of heating and nature and attachment of the handle. The common *sad-iron*, consisting of a solid triangular heater and handle of cast iron, remains in use notwithstanding the drawbacks of heating it before a fire and its hot handle. These are removed in many S. I. of recent introduction by making the body of the iron hollow, and heating it by incandescent charcoal, the flame of gas or a lamp, or a red-hot iron heater. A handle of wood or of perforated iron, which in some kinds is detachable, is also substituted for the solid cast-iron one. An ingenious cold-handled, double-pointed smoothing-iron of American invention is here shown. It is made of steel, lined with a non-conducting fire-cement, which heats quickly and remains hot for a long time. The handle is of wood and is removable, so that one handle only is required for a set of S. I. of the same kind.


Smoothing-Iron.

An *Italian Iron* for crimping and smoothing frills, &c., consists of a narrow hollow cylinder with one end closed and rounded and the other open. A tapering red-hot heater is introduced into it, and the articles to be ironed are pressed gently against the heated surface.

Smorza'to (It. 'extinguished'), a musical direction denoting that the sound is gradually to die away. In violin-playing this is achieved by drawing the bow to its full extent in gradually lighter style.

Smri'ti, 'that which is remembered and handed down by tradition.' The Sanskrit term for the whole of the Post-Vedic literature, which is believed to be founded on direct revelation, though delivered by human authors. It includes the Laws of Menu, the Mahabharata and Ramayana, the Puranas and Tantras. It is opposed to Sruti, or revelation.

Smuggling, according to the law of the United Kingdom, consists in importing or exporting prohibited goods, or goods without paying the custom or excise duties to which they are liable. The penalty is £100, or treble the value of the goods. Officers may search for smuggled goods anyone on board a vessel in any port of the United Kingdom, or anyone who has landed; and anyone obstructing an officer in execution of his duty is liable to a penalty of £100. But before a person is searched he may require the officer to take him before a justice, or superior officer of the customs, who shall determine whether there is reasonable ground for search. An officer misconducting himself in searching anyone is liable to a penalty of £10. In 1874, in the United Kingdom, 1157 seizures were made, and 1094 persons were convicted of S., the quantity of tobacco and cigars seized being 10,738 lbs., and of spirits 266 gallons.

Smut is a name given to a disease to which grasses, particularly cereals, are subject, from the attack of a fungus called *Ustilago carbo* or *segetum*, belonging to the section *Ustilagineæ* of the *Hypodermiæ* group. S. shows itself first in the organs of fructification, the epidermis of which is ruptured in a great number of places, a black soot-like dust then appearing through the slits. In colour and shape the S.-fungus resembles the bunt-fungus, but its spores are not half so large, and it possesses none of the disgusting odour that characterises the latter. For this reason, and further that the spores have generally been dispersed before the corn is cut, the disease is not so much dreaded as Bunt (q. v.), but it is sometimes very injurious by diminishing the produce. In wheat it is comparatively rare, whilst it is common in barley and more so in oats; rye hardly seems to be subject to it. The S. of maize and millet are of a similar character.

Smyr'na ('moss-rose'), a famous seaport of Ionia, on a bay of the Ægean Sea named after it, and at the mouth of the rivulet Meles, 40 miles N. of Ephesus. The origin of S. is lost in antiquity. After its destruction by the Lydians it lay four centuries in ruins, till the time of Alexander the Great, when it was rebuilt 2½ miles from its old site. Its trade increased rapidly, and under the first Roman Emperors it was one of the fairest and most populous cities of Asia. It proudly claimed to be the birthplace of Homer, named Melisigenes, from its river. It was partly destroyed by earthquakes in A.D. 178-80, but was restored by Marcus Aurelius Antoninus. About A.D. 68-69 a Christian Church arose in S., to which the Second Epistle of the Apocalypse is addressed. Almost a century later, Polycarp, supposed to be a pupil of the apostle John, here suffered martyrdom.—The modern S. (Turk. *Izmir*), 207 miles S.W. of Constantinople, extends 2 miles N. and S. along the sea-coast, which has been recently lined by a stone wharf. Its houses are mostly two-storied, built of wood cased in stone. S. is the seat of a Greek bishop, a Roman Catholic archbishop, and of consuls for most seafaring nations. There are several free hospitals belonging to different nations, three Greek and three Roman Catholic churches, four Protestant churches, an Armenian chapel, a synagogue, and numerous mosques, which are mostly ancient churches or *tekkes*. In 1878, S. has 18,750 houses and 6250 shops. The industry is unimportant, but the trade, both by caravans overland and by sea, is very large. S. is the chief mart for European commerce in Asia Minor. The imports, chiefly cotton goods and twist, glass, hardware, rice, coffee, copper, steel, silk velvet, and sugar, amounted in 1875 to £3,483,400; and exports, mainly valonea, raisins, figs, opium, cotton, carpets, sponges, gums, liquorice, cotton-seed, and wool, to £3,896,000. In the same year 1217 vessels of 775,445 tons entered the port of S.; cleared 1202, of 772,748 tons. Besides these, 2448 small Turkish and Greek vessels under 30 tons each entered, importing sundries to the value of £32,500, and cleared with European merchandise worth £25,000. The British steamship *Jura*, running fortnightly between S. and Adalia, imported goods worth £27,580, and exported goods worth £44,870. S. is defended by a battery on shore near its great military barracks, and by a ruinous castle at the entrance of the bay. With S. are connected the only railways of Asia Minor—one to Aidin, 83 miles; another to Philadelphia, 113 miles. Estimated pop. (1872) 180,000 (75,000 Greeks, 45,000 Turks, 15,000 Jews, 10,000 Catholics, 6000 Armenians). See General Consul C. v. Scherer, *S. mit besonderer Rücksicht auf die Geographischen, wirthschaftlichen und intellectuellen Verhältnisse von Vorder-Kleinasien* (Vien. 1873), and Lamec Saad, *Plan de S.* (Leip. 1877).

Smyr'na, Gulf of, an inlet of the Ægean Sea, at the head of which is situated the city of S. It is 40 miles in length by 20 in breadth, and affords excellent anchorage.

Snail, a common term applied to various species of *Pulmoniferous* or land *Gasteropoda* (q. v.). The typical snails form the family *Helicidæ*, in which there is a well-developed shell, but they have no *operculum* or horny plate. There are four tentacles, the larger pair bearing the eyes. The *foot* is well developed; as also is the *odontophore* or characteristic tongue. The S. is *hermaphrodite*, but the copulation of two such monœcious individuals is necessary to secure fertilisation of the eggs. Breathing is conducted in the S. by means of a lung-sac or pulmonary chamber, to which air is admitted by an aperture on the right side of the neck. The S. hibernates in winter, the mouth of the shell being closed by a plug of mucus known as the *epiphagus*. The common S. is the *Helix aspersa*. Equally well known is the *H. pomatia*, or edible snail of the Continent, which also occurs in the S. of England. Its shell is of a dirty-white hue, marked by four dark bands. The Roman epicures were fond of this mollusc, the best snails, according to Pliny, being imported from the Balearic Isles and Sicily. *H. nemoralis* is an edible Italian species; and the *H. vermiculata*, common at Montpelier, is also an article of luxury. The pond S. belongs to the family *Lymnæidæ*, which has a large, thin, sharp-lipped shell. *L. stagnalis* is the common water S. Equally well known is the *Planorbis corneus*, with its flattened discoidal shell. Other genera of water-snails are *Physa* and *Ancylus*.

Snake, a term often used synonymously with 'Serpent' (q. v.), but frequently restricted to denote the smaller and more common members of the Ophidian group. The common British S. (*Coluber*, or *Tropidonotus natrix*), also named the Grass S. and Ringed S., is a good example of a familiar S. This S. is common in many parts of Britain. It may attain a length of from 2 to 3 or 4 feet, and is of a greyish-brown hue tinted with green. Two crescentic spots of yellow are found at the back of the head, and two rows of black spots run down the length of the back, while the sides are also spotted. This S. is thoroughly harmless. The viper (*Pelias berus*), the only poisonous British S., is distinguished from the common S. by the zig-zag black marking which runs along the back, while the sides are spotted with triangular markings. A third species of S. (*Coronella austiaca* or *lævis*) occurs in Britain, but is extremely rare. It is, however, common on the Continent. It is of a brown colour spotted with black, but wants the zig-zag dorsal mark of the viper. The S. hybernates during winter, and large numbers are often to be found in manure-heaps in a torpid condition. See SERPENT.

Snake'-Bird. See DARTER.

Snake'-Eel, a term applied to certain species of *Teleostean* fishes allied to the family *Murænidæ*, of which the famous *Murana Helena* or Italian eel is the type. The name S.-E. originated in their serpentine appearance, which is increased by the tail-fin being rudimentary. The *Ophisurus serpens* is a common Mediterranean species.

Snake' River, or **Lewis River**, a tributary of the Columbia, over 1000 miles in length, and of great size, rises at an elevation of 7792 feet, in the national Park, Wyoming, and flows first S. then N.W. through Idaho, then N., forming the boundary between Idaho and Oregon, and lastly S. and S.W. till it joins the Columbia. The great cataract in Idaho is said to rival Niagara in grandeur as it exceeds it in height.

Snake'-root. See ARISTOLOCHIA and SENEGA.

Snake'-Stones are stones or other hard substances popularly believed to be efficacious in curing the bites of snakes, by placing them in contact with the wound. The many miraculous cures which are recorded can hardly be wholly without truth; and probably the explanation is to be looked for in the porosity of the substance used, in virtue of which the poisoned blood is drawn out before it has had time to permeate the whole body.

Snake'-weed, so called from its writhed roots, is Bistort (q. v.).

Snake'-wood. See LETTER-WOOD.

Snapdrag'on (*Antirrhinum*), both names being derived from the corolla resembling the *snap* or snout of some animal, is a genus of *Scrophulariaceæ*, comprising eleven species of annual or perennial herbs spread through Europe, W. Asia, and reaching N. Africa. *A. majus*, a native of Europe from Holland southwards, has long been a garden favourite in Britain, and many choice and handsome varieties are now to be seen. It has also become naturalised on old walls, railway cuttings, &c. In Russia an oil is extracted from the seeds, and the plant has bitter and stimulant properties. *A. Orontium*, a corn-field weed in England, is also a pretty plant.

Sneehætt'a, the highest peak of the Dovre chain, in Norway, rises from a mass of similar heights, a torn pyramid of mica-slate intersected with quartz, 7333 feet above the sea. Before the discovery of the Jotunfjelde, S. was regarded as the loftiest summit of Norway (q. v.).

Sneek, a handsome and prosperous town of Holland, province of Friesland, 12 miles S.S.W. of Leeuwarden. It is surrounded by fertile meadows, and has a large trade in butter, cheese, and cattle. Pop. (1877) 9990.

Sneeze-wood (*Ptæroxylon*) is a tree about 30 feet high belonging to *Sapindaceæ* (q. v.), and native of the forests of Uitenhage, Cape of Good Hope. The wood is valuable, said even to equal mahogany, and being of an exceedingly inflammable nature even when green, is eagerly sought by out-spanners for their fires. It excites sneezing when worked, hence the Dutch name Nieshout, and its English equivalent.

Sneez'ing consists in a violent and spasmodic action of the respiratory muscles. A deep inspiration is first taken, and the air is then forced violently through the nose, the mouth being closed, and the effort shaking the entire frame. The common cause of S. is irritation of the pohneiderian membrane of the Nose (q. v.), while in other cases S. may be excited even through the sense of sight and from irritation of the eye, through the sympathy which exists between the sense of sight and that of smell. Occasionally S. is excited by internal nervous causes, and independently of outward irritation of the nose or air-passages, and affections of the stomach or bowels are occasionally said to produce this effect. The custom of blessing a sneezing person has been long in vogue, and was practised by the ancients. Its origin is unknown, but in classical times S. during worship or sacrifice was regarded as a good omen.

Snia'tyn, a town of Austria, in the crown-land of Galicia, on the Pruth, 30½ miles S.E. of Lemberg by rail, has large tanneries and a trade in horses and cattle. Pop. (1869) 10,305.

Snig, a species of Eel (q. v.) found in many parts of England, and known by the olive-green colour of its back, the under parts being a golden yellow. The term, however, like that of 'Grig,' is employed by fishermen in a vague and loose way.

Snipe (*Gallinago*), a genus of wading birds, in some systems of classification named *Scolopax*. The Woodcock (q. v.) is now usually regarded as belonging to the latter genus. The S. has oval nostrils, and the first and second quills are longest. The thigh is unfeathered above the knee, and the claw of the hind toe is very long and curved. The common S. (*G. gallinula*) is plentiful in marshy districts. It attains a length of 10 inches, and is of a general brown colour with darker markings, the lower parts being white, whilst some of the wing-feathers have white tips. The eggs number four, and are of an olive-white hue, spotted with brown. The great or solitary S. (*G. major*) attains a length of 12 inches. It is not so common as the previous species, and whilst in general colour it resembles the common S., its under parts are darker, and its tail in flight is spread out like a fan. The *G. media*, or Jack S., occurs in Britain chiefly as a winter visitant. It is also named the 'Judcock,' and is the smallest of the British snipes. A common American S. is the *G. grisea* or red-breasted species; *G. Brehmi*, Brehm's S., and Sabine's S. (*G. Sabinii*), being rare in Britain. The sea S. is the *Tringa cinchus* or Dunlin (q. v.), and the summer S. is the Sandpiper (q. v.). Snipes are active, wary birds, counterfeiting lameness to lead observers away from their nests. They feed on worms, crustaceans, &c.

Snipe'-Fish. See TRUMPET-FISH.

Sniz'ort, Loch, a large inlet of the sea in the N.W. of Skye, between Vaternish and Trotternish, picturesquely studded with islands in its upper part. Length 16 miles; greatest breadth about 9.

Snorri Sturlason, the Icelandic poet and historian, born 1178 at Hvami in the Dala district of Iceland, was the son of Sturla Thordsson, the founder of the powerful family of the Sturlungs. At three years of age he became a foster-son of Jon Loptsson, grandson of Sæmund, author of the *Elder Edda*, then the most influential and gifted man in Iceland, and after his death (1197) S. remained at Odda with his son Sæmund, and by his marriage, first with Herdys (1199), and after her death with Hallveg Ormsdatter, gained great possessions, sometimes appearing at the Althing with a following of 800 to 900 men. Twice was he appointed 'Laugmand' (1219-23, and 1226-36). In 1218 S. travelled to Norway, where he gained great favour with Duke Skuli, returning to Iceland in 1220. In 1237 he was obliged to fly to Norway in consequence of a league formed against him by his brother Sighvat and his nephew Sturla. Here by his poetical powers he aided his patron Skuli in his war against King Hacon, but was in consequence, on his return to Iceland, pursued by the hatred of the king, and murdered through his influence by his sons-in-law at Reykholt, September 22, 1241. S. was the last and one of the greatest of the northern Skalds. He wrote many panegyrics and heroic songs, and is believed to have been the author of part of the *Younger Edda*. His principal work is the *Heimskringla* ('ring of the world'), a collection of Sagas on the ancient history of Norway. It was translated into Danish by Claussen in 1559, but not published until 1697 by Peringskjold (Stockholm). The best edition is that published with a Danish translation by Schöning and Werlauff (Copenhagen 1777-1826). It was translated into English by Samuel Laing (Lond. 3 vols. 1844), and German translations of parts have been published by Wachter (2 vols. Leip. 1835-37), and Mohnik (Strals. 1835).

Snow is the form of water in which the moisture of the air is precipitated when the condensation takes place at a temperature below the freezing point. Each flake which falls is composed of a number of minute crystals of ice, which present countless modifications of the hexagonal system in which this mineral crystallises. These crystals adhere together to form an irregular cluster; and consequently the incident rays of light, which are refracted and reflected so as to present *individually* the prismatic colours, are scattered after reflection in all directions, and combine to give to the eye the colour sensation of white. By the application of sufficient pressure the slightly adhering crystals may be brought into true *molecular* contact, when the S. loses its white colour and assumes the form of ice. This transformation is constantly taking place in the formation of glaciers, whose deep-blue ice is traceable through imperceptible gradations to the eternal snow which caps the mountain summits. The height above the sea-level at and above which lies the region of perpetual S. depends mainly upon the latitude of the place, though it is considerably influenced by the surface configuration and by the nature of the prevalent winds. Thus, on the southern slope of the Himalayas in 28° N. latitude, the *S.-line*, or lower limit of perpetual S., is 15,800 feet above the sea-level; while on the northern slope, which looks over the dry plateau of Thibet, it rises to 17,400 feet. A similar phenomenon is shown in the Cordilleras of Bolivia in S. America (14°-18° S. latitude), on the western range of which the S.-line is at a height of 18,500, while on the eastern range, which is exposed to the moist easterly trade-winds from the Atlantic, it is 2600 feet lower. At Quito, on the equator, the S.-line is 15,620 feet, which may be taken as a fair average of the S.-line in the tropics. In these warm regions S. does not fall at low altitudes. 30° N. latitude is about the southern limit of snowfall at the sea-level in the northern hemisphere. The bad conducting power of S. for heat checks the earth's radiation, protecting the sprouting herb from the nipping frost, and affording the Eskimo material to construct a warm shelter from the inclement winter.

Snow'berry is a name given, from the white colour and snow-like pulp of its fruit, to *Symphoricarpus racemosus*, a N. American shrub belonging to the honeysuckle family. It is of common cultivation in shrubberies. The name is also given to the white-fruited *Chiococca racemosa* (*Rubiaceæ*), the root of which, although a violent emetic and cathartic, is administered in Brazil as a certain remedy for snake-bites.

Snow' Bunting, also named **Lap'land Bunting** and **Snow Fleck**, is the *Plectrophanes nivalis* of ornithologists, and belongs to the order Insessores and to the *Emberizinæ* or Bunting family. The bill is short, and the second and third quills are longest. The hinder claw is long and straight. This bird occurs plentifully in Britain in winter, but usually passes to the N. in summer. The male is pure white in winter, the back and wings being of dark brown. In summer the plumage is a tawny brown, variegated with white spots. The average length is 7 inches. In Lapland the bird is snared for food.—The **Snow Bird** is a name given to the *Fringilla hymenalis* of America, a species of finch widely distributed over the New World.

Snow'don (an Eng. trans. of the Welsh name *Creigiawr*, 'snowy hill'), a mountain-range in N. Wales, extending through Carnarvonshire, from the coast near Nevin in the S.W. to Pen-maen-mawr, near Conway, in the N.E. The name is also applied to the loftiest elevation in the middle of the range, 3571 feet in height, known as Y Wyddfa ('the conspicuous'). Carnedd Llewelyn ranks second, being 3469 feet high. The ascent to the summit of S. is made from Beddgelert on the S., Llyn-Cwellyn on the W., Capel Curig on the E., and Llanberis on the N. The last, being the easiest, is the usual route for tourists, for whom a house has been erected on the summit.

Snow'drop (*Galanthus*, Gr. 'milk flower') is a genus of three species of *Amaryllidaceæ* (q. v.), of which the common S. is indigenous through Europe from Holland southwards, reaching also W. Asia. It is possibly a native of a few English counties, but as generally seen beyond garden bounds originates either through actual planting, or as an accidental escape from cultivation. Gerard had it in his garden in 1596, and calls it 'a lesser sort of early bulbous stocke gilloflower.' The affix 'drop' refers to the large pendants used by the ladies as ear-rings, &c., in the 16th and 17th centuries. *G. plicata* (the Crimean S.) is similar, but larger and handsomer.

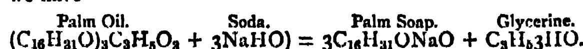
Snow-Shoe, a light flat frame worn in northern latitudes for walking on snow. It is formed of a boat-like hoop, usually 4 feet long by 16 inches broad, of elastic wood, filled with a webbing of interlaced thongs or wicker-work on which the foot rests.

Snuff, a fragrant powdered preparation of tobacco inhaled through the nose. It is made by grinding, in conical mortars or 'mills' worked by power, the chopped leaves and stalks of tobacco in which fermentation has been induced by moisture and warmth in closed rooms. There are numerous varieties of S. Some, like the rappees, are moist; others, for example the Irish and Welsh, are highly dried. A roasted Irish S. called 'Lundy Foot,' or 'Irish Blackguard,' has wide repute for excellence. The admixture of different flavouring agents and delicate scents also gives rise to fanciful names for snuffs having exactly the same modes of preparation. French rappee is superior to all others, and its manufacture has been brought to high perfection at the French Government Factory. The tobacco is subjected to two processes of fermentation, whereby aroma and strength are acquired, and the nicotine and organic acids removed. The leaves and stalks, moistened with *salt water* (to prevent putrefaction), are pressed into cakes and sliced, and left in open chambers for five or six months to ferment and develop aroma. After that time the tobacco is ground in mills out of contact with air, in order to preserve the aroma, and the powder, *rapé sec*, is, after damping, conducted to closed wooden chambers to undergo during ten months the second fermentation, which imparts strength to the S. Finally, the S. is gathered from the fermenting-rooms into one large chamber, where it matures for one month; it is then ready for stamping into casks. The machinery used in the French factory is almost wholly automatic. S. is very commonly adulterated in order to increase its bulk or pungency. The consumption of S. in the British Isles has been estimated to amount to 500 tons annually. The practice of S.-taking was introduced from America into France in the 16th c., and in the middle of the following century it was very general throughout Europe. The consumption of S. greatly increased in England during the reigns of William and Anne, and S.-boxes of gold, silver, precious stone, and enamels were then not uncommon.

Sny'ders, François, an animal-painter of the Flemish school, was born at Antwerp in 1579. He studied under the younger Breughel and Henri van Balen, and worked for

Rubens in conjunction with Jordaens. Several of his paintings were executed for Philip III. of Spain and the Archduke Albert, at that time governor of the Netherlands. At first he painted many flower and fruit pieces, but latterly confined himself wholly to animals, whose animated action he depicted with great accuracy. None of his pictures are to be found in London galleries, but many of the Continental musées possess them, the largest number being in Madrid and St. Petersburg. S. died at Antwerp in 1657. See Deschamps' *Vies des Peintres Flammands* (1753-63).

Soap, in chemistry, includes all combinations of the fatty acids with alkaline or metallic salts; but only such soaps as are soluble in water are of value for detergent purposes, and of these only compounds with potash and soda are commercially recognised under the name of S. There are two distinct varieties of S. generally recognised—*hard or soda S.* and *soft or potash S.* The materials used in the manufacture of hard S. are tallow, palm-oil, cocoanut-oil, rosin, and caustic soda. The theory of the formation of S. from these materials is that substances like potash and soda break up the chemical combinations existing in oils and fats, and take the place of glycerine, of which, with certain fatty acids, these bodies are composed. Thus taking, for example, a palm-oil S., we have—



Palm Oil. Soda. Palm Soap. Glycerine.

$$(C_{16}H_{31}O)_3C_3H_5O_3 + 3NaHO) = 3C_{16}H_{31}ONaO + C_3H_5 3HO.$$

The process by which S. is made from these substances is briefly as follows:—A quantity of any of the above oils is introduced into an enormous pan (some are made to contain as much as 30 tons of finished S.), which is made of boiler plate and heated either by direct fire, by a coil of steam pipes within it, or by a steam jacket surrounding it. To the oil in the pan is added a ley or solution of caustic soda. More caustic ley of increasing strength is by degrees added until an excess of alkali is indicated, after which an additional quantity of oil is placed in the pan, and the adding of alkali is again repeated, and so on, till the pan is filled. The S. is now 'salted out' by throwing into the pan about 10 lbs. of common salt for every 100 lbs. of fatty matter used, the effect being that the S. is rendered insoluble in the strongly-salted liquid, and rises in an almost pure condition to the surface. The watery substratum is drawn off, and the solid S. left in the pan is again heated up with a quantity of weak ley whereby the S. is consolidated into a homogeneous mass. After allowing the 'boiling' to settle for some time, the uncombined liquid is drawn off and the S. is cast into iron frames or moulds. When it has cooled the S. is cut up into bars by a strongly framed apparatus on which thin strong wires are strung at equal intervals. Pure pale or curd S. ought to contain when newly made about 7 per cent. of soda, 63 of fatty matter, and 30 of water, and by keeping in a comparatively dry atmosphere it parts with water, thereby becoming harder and so much more valuable. S. can be made to take up a large amount of water, and yet preserve a firm, solid appearance, and sophistication in this direction is very common. In addition to pale or curd S., the following other kinds of hard S. may be enumerated:—Yellow S., into which rosin enters; mottled S., the mottling being sometimes due to the addition of Prussian blue, and sometimes to iron present; Castile S., which is very hard, and ought to be prepared from olive-oil; silicated S., prepared by the addition of silicate of soda, by a patent method introduced by Mr. William Gossage of Widnes. Fancy or toilet soaps are made mostly from a basis of pure curd S., which may be dyed, perfumed, and moulded into various forms. Transparent S. is made by dissolving ordinary S. in spirit, and distilling off the greater part of the spirit from the solution. Special kinds of S. are prepared for use by calico-printers, turkey-red dyers, bleachers, tweed finishers, scourers, &c. The quantity of S. manufactured in Great Britain in 1872 was estimated at about 205,000,000 lbs., 13,200,000 lbs. of which were soft and silicated S., the remainder being hard, and at the present time the amount made has not in all probability very greatly increased.

Medicinal Properties of S.—*Sapo animalis*, or hard S., is described in the British Pharmacopœia as a soda S. made with purified animal fat, consisting principally of stearin. It is soluble in water or spirit, slightly alkaline, but not greasy, and is the basis of all toilet soaps. *Sapo durus*, hard or white Castile S., is soluble in rectified spirit. S. is prescribed in medicine as a laxative, antacid and antilithic, and for removing gall-stones. In combination with rhubarb it is administered in cases of constipation with torpid liver. S., when prescribed by itself, may be easily swallowed, wrapped in wafer paper.

The pharmaceutical preparations of S. are *Emplastrum cerati saponis* and *Emplastrum saponis*, used chiefly as a protective. *Linimentum saponis*, or S. Liniment, is prepared with S., camphor, oil of rosemary, rectified spirit and water, and forms the basis of numerous liniments. *Pilula saponis composita* contains opium powder in the proportion of one grain in six nearly. *Medicated* S. is largely prescribed in skin diseases, and of this there are many varieties, such as juniper tar S., oxide of zinc S., carbolic acid S., &c. *Sapo mollis*, or *soft* S., is made with olive oil and potash, and is soluble in rectified spirit, not imparting an oily stain to paper. *Soft* S. is contained in *Linimentum Terebinthinæ*.

Soap'berry (*Sapindus Saponaria*) of the W. Indies is a small tree with pinnate leaves, numerous small, white, crowded flowers, and a berry about the size of a cherry. The fleshy covering of the seeds, and in a less degree the root, make a lather in water, and serve all purposes of soap. It has been observed, however, that if used for washing cloth the texture is thereby injured. The seeds possess medicinal properties; they are also made into ornaments. *P. detergens*, a larger and handsomer tree, is cultivated in India for the saponaceous pulp of the fruit, which is an important article of trade in the Punjaub and North-West Provinces under the name of *Ritha*. The generic name *Sapindus* is an abbreviation of *Sapo-Indicus*, Indian S. See SAPINDACEÆ and SAPONIN.

Soap-Stone. See STEATITE.

Soap'wort (*Saponaria*), a genus of *Caryophyllaceæ*, natives of Europe and temperate Asia, numbering about thirty species of annual or perennial herbs. The radical leaves are spathulate, those of the stem narrower; the flowers in cymes, white, lilac, red, or yellow; the calyx five-toothed and tubular; there are five petals, ten stamens, two styles, an oblong capsule, two-celled at the base, and four-valved at the top. The common S. (*S. officinalis*) was formerly grown in England for its saponaceous properties, still locally remaining as a naturalised plant in the vicinity of old villages in the S.W. counties and N. Wales. A double-flowered form is seen in cottage gardens. The white, creeping, fleshy, stoloniferous rootstock and the leaves bruised in water forms the required lather for washing and scouring purposes. *S. vaccaria* is also called, and serves as S.; and the root of the allied *Gypsophila struthium*, known as Egyptian soap-root, is extensively used in Spain, &c. See SAPONIN. In Chili the bark of *Quillaia saponaria*, named quillia or soap-bark, is a common substitute for soap for washing clothes, 2 oz. of the bark being sufficient to cleanse a dress, besides imparting a remarkable lustre to wool fabrics, and removing spots and stains.

Sobb'ing, a convulsive respiratory act, depending on nervous irritation, and caused by spasmodic movements of the *diaphragm* or *midriff*. The glottis is temporarily closed, and thus prevents entrance of air into the lungs in S.

Sobra'on, a village in the district of Ferozpur, Punjaub, British India, on the left bank of the Sutlej. It is celebrated for the battle fought here, 10th February 1846, by Lord Gough, in which the Sikh entrenchments were stormed with great loss, and the enemy driven into the river. The loss of the Sikhs, in killed, wounded, and drowned, was 13,000. This victory terminated the first Sikh war.

Soc'age or **Socc'age** is defined by Stubbs in the 'Glossary' to his *Select Charters Illustrative of English Constitutional History*, as 'a tenure of land on condition of fixed and determinate services, especially that of suit to the lord's court or *soken*' ('jurisdiction'). It thus differed both from knight-service and from villenage. By an Act passed during the Commonwealth and confirmed by 12 Car. II. c. 24, all tenure by knight-service was abolished, and all real property in England and Ireland was directed to be held by S. tenure, except church lands held in free alms.

So'cialism, a term which, as now used, is practically synonymous with Communism, though strictly speaking there is a distinction between the two words, which is explained in the

article COMMUNISM (q. v.). Socialistic theories are common in works of imagination, such as Plato's *Republic*, More's *Utopia*, Harrington's *Oceana*, and others of the same type, but it was not until the middle of the 18th c. that S. began to take practical form. Two Frenchmen, Morelly (whose *Code de la Nature* appeared in 1755) and Mably (1709–85), published Socialist schemes which attracted some attention in the times of intellectual ferment which preceded the Revolution. The conspiracy of Babœuf, too, by which the Directory was menaced in 1797, was avowedly communistic in its objects. In the first half of the present c. S. assumed widely divergent forms in the speculations and experiments of St. Simon (q. v.), Owen (q. v.), Fourier (q. v.), Louis Blanc (q. v.), and Proudhon (q. v.). Its most recent and probably its most important development, however, is in the S. of Germany, where it has attained gigantic proportions within the past twenty years. Perhaps the first of the Socialist thinkers in Germany was Herr Karl Grün, who in his book, *Die Soziale Bewegung in Frankreich u. Belgien* (Darmstadt, 1845), advocated violent revolutionary theories. The two undoubted leaders of the party, however, are Karl Marx (q. v.), and Ferdinand Lassalle (1825-64). The latter is one of the most extraordinary characters in modern German history. Born, like Marx, of a Jewish family, he early distinguished himself by his profligacy and his brilliancy, being particularly known as an enthusiastic Hegelian. In Paris in 1845 he made the acquaintance of Heine, who describes him as possessing 'the widest knowledge and the deepest penetration' he had ever met with. In Berlin he was known in the highest literary circles as *das Wunderkind.* Having taken an active part in the revolutionary disturbances of 1848, he was arrested and tried, defending himself in a speech which concluded with these remarkable words:—'I neither wish nor deserve to be acquitted unless it is recognised that an appeal to arms is the right and duty of the people.' Strange to say, he was acquitted! It was in the last three years of his life that his most active and successful exertions in the cause of S. were made, and since his death, which took place in a duel at Geneva, he has been looked upon as the protomartyr of German S., his birthday being celebrated as a solemn feast by Socialists throughout the country. His principles may be gathered from his two great aphorisms—'The brazen wages-law is invincibly opposed to the amelioration of the workman's lot.' 'The time of the Fourth Order has arrived—the Estate of the Workmen must replace the Estate of the Citizens.' Though the systems of Lassalle and Marx are not identical, they agree in demanding revolutionary change, and in opposing the peaceful theories of co-operation and 'self-help,' whose great apostle is the benevolent Schulze-Delitzsch, and which are regarded with favour by the *Fortschritt* party in general. A Socialist Congress is held every year in Gotha, by which a Propaganda Committee is appointed, which again has in its employment more than a hundred preachers and literary expounders of S. A Socialist review is about to be (1878) established, and there are already 34 Socialist newspapers, the principal being the *Vorwarts*, published at Leipzig under the direction of Messrs. Liebknecht and Hasenklever. There has been a proposal to establish a Socialist University, but it has not yet been adopted. The leading Socialist organisation is *Socialistische Arbeiterpartei Deutschlands*, formed in 1871 by the fusion of the *Allegemeine Deutsche Arbeiterverein* founded by Lassalle in N. Germany, and the *Democratische Arbeiterverein* founded by Marx in the S. The last elections (July-August, 1878) have resulted in the return of nine Socialists to the German Parliament. The former Parliament contained twelve, but it is to be noted that although the number of Socialists elected is smaller, the aggregate number of votes obtained by them has very much increased. The attempts of Hödel and Nöbiling to assassinate the Emperor Wilhelm have led to the promulgation of a very severe law against the Social-Democrats as they are technically termed. The police are empowered to suppress Socialist papers, and forbid Socialist meetings, while fines and imprisonment can be imposed on those who disregard the restrictions. Altogether, the question of S. is the most difficult and dangerous in the internal politics of modern Germany. In other countries, such as Russia, Belgium, and Denmark, S. has also manifested itself more or less actively. In the United States it has begun to create some anxiety, as it appears to be spreading among the vast proletariat of the country principally through the influence of German propagandists. See Schäffle's great work, *S.* (translated by Kaufmann, Lond. 1878); Von Sybel's *Die Lehren des heutigen Socialismus* (Bonn 1872); Jäger's *Der Moderne Socialismus* (Berlin 1873); Becker's *Geschichte der Arbeiter-Agitation F. Lasalle's* (Brauns. 1874); Noyes, *Hist. of American S.* (1870); Le Play, *L'Organisation du Travail* (Par. 1871), and *La Reforme Sociale en France* (1872); Nordhoff, *Communistic Societies of the United States* (1875); Van Mehring, *Die Deutsche Socialdemocratie: ihre Geschichte und ihre Lehre* (Brem. 1877); Cohen's *Études sur l'Empire d'Allemagne* (Par. 1878).

Soc'iety Islands, an archipelago in the S. Pacific, lying between 16°–18° S. lat., and 148°–155° W. long. There are thirteen principal islands, besides numerous islets, and the total area of the group is estimated at 734 sq. miles, with a pop. of about 24,000. The chief islands are Tahiti (q.v.), Eimeo, Huahine, Raiatea (pop. 1200 in 1875), Tahaa (pop. 900), and Bora-Bora. The S. I. are of basaltic formation, and abound in lofty and precipitous mountains, usually fringed by a belt of flat land. Two peaks in Tahiti are respectively 7000 and 8700 feet high. Coral reefs are very abundant round all the islands. The soil being extremely fertile and water plentiful, the vegetation of the islands is most luxuriant. The climate is healthy, but enervating, and terrible hurricanes occur from time to time. The inhabitants belong to the Polynesian race (see POLYNESIA), and are handsome, brave, and intelligent, but indolent, fickle, immoral, and passionately fond of ardent spirits. On account of their indolence, Chinese and Hervey Islanders are imported to work the cotton plantations. The people of Huahine, however, are enterprising traders, and their flag is seen as far away as San Francisco. The chief exports from the islands are cotton, cocoa-nut oil, copra, pearl shell, and oranges. The S. I. were discovered by De Quiros in 1606, but were first made known to the world by Cook, who visited them in 1769, and named them after the Royal Society, at whose recommendation the expedition which he commanded was fitted out. They have been the scene of missionary labours since 1797, and have for many years been entirely Christian. Taking advantage of a quarrel between the Protestant and Roman Catholic missionaries, the French espoused the cause of the latter, who were the last in the field, and seized the islands in 1844. In 1847 they were expelled by the natives from Huahine, Raiatea, and Bora-Bora, which, with small dependencies, are now ruled by their own sovereigns. Over the remainder of the group the French exercise a protectorate, tantamount to possession. The nominal sovereign, Pomare, Queen of Tahiti, died 17th September 1877. See *Queen Pomare and her Country*, by the Rev. G. Pritchard (1878).

Soci'nus, Lælius (Lelio Sozzini), was born at Sienna in 1525 of a good Italian family. His father was a lawyer, but the young man seems early to have turned his attention to theology. In 1547 he left Italy, and after wandering over a considerable part of Europe finally settled at Zürich, where he continued till his death in 1562, except for two short visits to Poland, in 1551, and again in 1558. He lived on terms of intimacy with most of the leading theologians of the time, being on one occasion strongly reproved by Calvin for spending so much of his energies on '*illa quæstionum portenta;*' but although he early adopted views almost equally at variance with the doctrines of the Reformers and of the Romish Church, he did not attempt to propagate them, except by letter among his relatives. Some small tracts attributed to him are published in the *Bibliotheca Fratrum Polonorum.*—**Faustus S.** (Fausto Sozzini), nephew of the preceding, was born at Sienna in Tuscany, December 6, 1539. His father, Alexander S., was for some years professor in Padua, but died early, and the young Faustus was brought up by one of his uncles, to whose carelessness it is probably due that the future heresiarch was miserably grounded in all branches of learning, literary, philosophical, and theological. In 1559 his family got into difficulty with the Inquisition, and S. retired to Lyon, from which the news of his uncle's death called him to Zürich. Shortly after this he returned to Italy under the protection of the Grand Duke of Tuscany, and spent the next twelve years in dilettante politics. Growing disgusted at last with this life of theological inaction, in 1574 he left Florence and betook himself to Basel, where he remained three years, and wrote his treatise *De Servatore.* Thence he went to Transylvania, and in 1579 to Cracov in Poland; but not agreeing with the Unitarians of those countries on some points

of doctrine; he took up his residence with a Polish noble, Christopher Morsztyn, one of his most devoted disciples, whose daughter he married in 1586. The death of this lady in the following year, and the loss of his Italian estates confiscated by the Church, seem to have driven him again to Cracov. In 1588 he was present at the Synod of Unitarians in Brzesc; but ten years afterwards he had again become so unpopular that he was with difficulty rescued from the hands of a Cracov mob, and had a second time to take refuge in privacy, a Polish knight, named Abraham Blouski, offering him an asylum in the little village of Luclav, 9 miles from Cracov, where he died, March 3, 1604. He left one daughter, Agnes, who married Stanislas Witzowatz. In personal appearance S. was tall and slender, with a dignified but vigorous expression. His works, to which Przipcov has prefixed a biography of S., form the first two volumes of the *Bibliotheca Fratrum Polonorum*, published at Amsterdam in 1656 in eight folio volumes. The principal are *Auctoritas Sacræ Scripturæ* (Racov 1588); *De Jesu Christo Servatore* (Basel 1594); *Christianæ Religionis brevissima Institutio* (Basel 1604).

Faustus S. is looked upon as the chief founder of the sect of the **Socinians**, though there is no doubt that he himself derived almost all his theological views from his uncle Lælius. The Socinians rose into importance in Poland, but spread gradually during the 17th c. into Prussia, England, and the Netherlands, gaining most adherents in the last-mentioned country. It is customary to speak of the S. body of doctrine as scanty, but it is so only as containing few of the doctrines found by other Christians in the Word of God; really it is as comprehensive as any orthodox creed, inasmuch as it contains a system of positive opinions on all these doctrines. Socinians deny that the books of the Bible were written under infallible supernatural guidance, and lay down as a fundamental principle of interpretation that nothing contrary to human reason can be contained in a revelation from God, in the application of which they are in the habit of arguing that since a particular text may possibly not have the meaning usually assigned to it, therefore it cannot bear that meaning. In speaking of God, they dwell on His goodness and mercy, practically excluding His holiness, and recognise only obscurely His omniscience. Man, they hold, has no natural proneness either to good or evil, and his sin is forgiven because God's nature leads Him to forgive, man's moral constitution needing no change. The death of Christ is not a satisfaction for sin to divine justice, but the necessary preliminary for His resurrection, whereby He established the doctrine of immortality, and so induced men to exercise their natural powers into such action as would secure for them eternal life. Jesus Christ therefore was a mere man, specially appointed by God to convey His will to men, and, as being only a teacher of righteousness, can in no true sense be called a Redeemer. The first synopsis of Socinian doctrine seems to have been a *Compendium Socinianismi*, published by Ostorodus and Voidovius in 1598; but their authoritative symbolical treatise is the *Racovian Catechism*, first published in 1609, with a dedication to our King James I. A corrected and revised edition appeared in 1684. See *Bibliotheca Fratrum Polonorum*; *Memoirs of Faustus S.*, by Joshua Toulmin (Lond. 1777); *Der Socinianismus* (Fock, Kiel, 1847).

Socle, or **Zocle**, a plain block or plinth, forming a low pedestal to a statue or column. The term is used only in reference to classical architecture.

Soco'tra (Sansk. *Dwipa-Sukadara*, 'the island of bliss'), an island off the E. coast of Africa, 148 miles N.E. of Cape Guardafui. It is 82 miles long and 20 wide, with an area of 1520 sq. miles. A plain from 2 to 4 miles wide extends round the coast, rising precipitously to a limestone plateau from 700 to 1900 feet high. In the N. is a range of granite mountains, whose loftiest peak is 4656 feet in height. Few of the streams being permanent, the island is comparatively barren, though capable of easy artificial irrigation. The inhabitants, who are Mohammedans of mixed Arabian and African descent, keep sheep, goats, and cattle, and asses roam wild. Aloes, dragon's blood, tanned hides, and pearls are exported. Tamarida, the chief settlement, is but an insignificant village. The island is ruled by a Sultan, who in 1876 concluded a treaty by which he became a feudatory of Britain, to which S. is only important from its proximity to the Red Sea entrance. See Royal Geographical Society's *Journal* (vol. v. 1835); *Geographical Magazine* (vol. iii. 1876); *Journal of the Anthropological Society* (vol. vii. 1878).

Soc'rates, one of the greatest of ancient philosophers, was born at Athens about 469 B.C. Sophroniscus, a statuary, was his father; Phænareté, a midwife, his mother. We have no accurate information regarding his early years, but he seems to have followed the ordinary Athenian course of instruction, to have practised his father's calling for some time, and finally, urged by that divine call which all great moral reformers have felt—the voice of the God, he said, impelled him—to have taken upon himself the improvement of the citizens. He never committed his precepts to writing, but frequented the chief resorts of men in the city, where he gathered a crowd of disciples round him, and then discussed with them what was temperance, what virtue, and questions of a like nature.

The external personality of S. was striking rather than imposing. According to all accounts he was exceedingly ugly. He was a large, strong man, with a protuberant stomach. His eyes were crab-like, his mouth very large, his lips thick, his nose flat, his nostrils broad and open. He was scantily and shabbily clothed, and he went barefooted even in the coldest weather. Yet when he spoke all these eccentricities were forgotten. As Plato makes Alcibiades say, his figure was but the mask of Silenus that concealed the image of the God. His voice was sweeter than the Siren's song, and it charmed men to virtue. His conduct was in keeping with his precepts. He was perfectly courageous. At the risk of his life he disobeyed the thirty tyrants when they commanded him to act unjustly, and this is but one of several cases. But he was no sour Pharisee; he was as much at home at a revel as at a philosophic discussion. In the inimitable picture of a classical carousal given in the banquet of Plato, S. is the central figure. His nature had no trace of bitterness in it, and when Aristophanes gave in the 'Clouds' a highly amusing though glaringly unjust picture of the philosopher, S. attended the representation and laughed heartily at the points. Such is an outline of that strange personality—the sphinx of philosophy, as he has been called—who remains, after all, such a puzzle to us. We have only a few positive philosophical precepts on which his teaching was founded. These were preceded by a method; and this has two sides—1st, negative; 2d, positive. 1. As to the negative, it was a confession, partly real partly pretended, of ignorance. 'S.,' says Aristotle, 'asked questions, but he did not answer them, for he professed not to know.' Here too we have the famous Socratic irony. S. would interrogate some official or specialist as to his peculiar subject, and profess himself eagerly desirous of information. This would be readily given; but it would lead to questions, and these to others, till it was found that the pretended knowledge was no knowledge at all. Thus men were convinced of their own ignorance. 2, Positive.—Here we have his method of induction and definition. Suppose, for instance, temperance was the subject under discussion. He would collect a number of instances of temperance, and then examining what was common to the whole of them, he would state this as a definition of the notion of temperance. The range of his inquiries did not extend beyond moral subjects. The science and philosophy of his day were but a metaphysical explanation of nature, and of no value; and we cannot blame S. for neglecting them, and for making the questions of moral conduct and of a moral life sole subjects of his inquiry.

The central doctrine of his philosophy was 'Virtue is knowledge.' The good and prudent man is the one who will do that which is best for him; but virtuous conduct is really that which is best for every man. Vice, then, is ignorance. But from this readily follows another Socratic doctrine, 'No man is willingly vicious,' because a man will do that which he thinks best for himself; but virtue being that which is best, if he do it not it is simply from ignorance. Nay, even he, if we can imagine such a thing, who knowingly does wrong is better than he who ignorantly does right. In the one case we have the knowledge, and that will at last assert its supremacy. In the other case we have simply meaningless action. Thus there is something higher in the conscious wrong-doing of a man than in the unconscious well-doing of a brute. From these principles another famous Socratic position, the unity and identity of all the virtues, clearly follows; for if virtue be knowledge, then the virtues are simply the applications of knowledge in the various spheres of human life.

Connected rather with his personality than his philosophy was the 'demonic' element in him. He announced that an inner voice warned and admonished him on all important occasions, and this voice he believed it to be his duty to obey. When he said it was a spirit that addressed him, he was probably speaking in a figure; rather 'it was the fine, deep, discerning tact and instinct of a pure soul that saw clearly into life, and involuntarily presaged the good and the consequent everywhere, even in the most individual emergency.' After a life spent in teaching the citizens, S. was accused of neglecting the established divinities, introducing new ones, and corrupting the youth. He was found guilty, condemned, and executed 399 B.C. The causes of his accusation, trial, and condemnation were, (1) that he had enraged the citizens by his criticisms on their forms of government; (2) his fearless speech had made him many enemies; (3) a numerous party confounded him with the Sophists (q.v.), and considered him a dangerous innovator. The majority for condemnation was a small one, and if he had condescended to humble himself before his judges, he would certainly have escaped the capital penalty. This he resolutely refused to do, and the Athenians were thus step by step driven to the commission of a deed of which they afterwards bitterly repented.

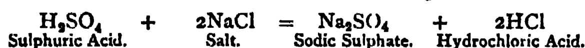
S. is as important to philosophy through his personality as through his doctrines. Powerful, indeed, must have been the personal influence of the man who attracted to himself the wayward, brilliant, vicious Alcibiades, the plain blunt soldier Xenophon, and the lofty-minded Plato. The last two are our chief authorities regarding S. The former in a matter-of-fact way gives us jottings of the conversations or memorable sayings (*Memorabilia*) of S. The latter has made him the central figure of nearly all his Dialogues, and probably the early ones (certainly not the later) contain true pictures of the life and teaching of the master. In the *Phædo* the death-scene is described with unsurpassable pathos and beauty, and the *Apology* is the defence of S. to all time—the appeal to posterity from a narrow and bigoted tribunal. For later accounts the histories of philosophy may be consulted. See the authorities cited under Plato; the best work in English on the subject is Zeller's *S.* (2d ed. 1859; Eng. trans. by Reichel; Lond. 1868, 2d ed. 1877); and Jowett's ed. of the *Dialogues of Plato* (2d ed. 5 vols. 1876).

Soc'rates (*Scholasticus*) was a barrister at Constantinople during the first half of the 5th c., who wrote (in Greek) a history of the Church from the reign of Constantine, or from the point at which that of Eusebius (q. v.) stops (324) to 439. The history is very valuable for the time it covers, as it was written for the most part by a contemporary, and is remarkably impartial. The best editions are those of Reading (Cambridge), and Hussey (3 vols. Oxf. Clar. Press, 1853). An English translation was made at Cambridge, 1683, and others have since been published by Bagster and Bohn.

So'da Manufac'ture. In one form or other soda occurs in the greatest abundance throughout the world; but the sources whence it has at any time been obtained for manufacturing purposes are not numerous. Previous to the year 1793 the whole supply of the raw materials of the S. M. was obtained from the ashes of certain marine plants. The principal material was barilla, a crude sodic carbonate obtained by the incineration of marine plants, principally of the genus *Salsola*, and which formed at one time a valuable industry in Spain, Sicily, &c. In Great Britain a similar product was obtained by the treatment of seaweed, which was and is known as Kelp (q. v.). The use of these materials as a source of soda was entirely superseded by the introduction of the famous process of Leblanc, an invention which marked a great epoch in industrial chemistry. At the Revolution in 1793, France was cut off from all external sources of raw soda, and the National Convention appealed to the nation for the suggestion of sources within their own limits. Among the proposals submitted was Leblanc's process, already in practical operation, which gradually revolutionised the whole industry. For a long time after its introduction into England, however, its development was seriously retarded by the excise duties on common salt.

In the soda process, which, though modified and improved, is essentially that first devised by Leblanc, there are three distinct stages:—1st, Decomposition of common salt by means of sulphuric acid, with the formation of salt cake (sodic sulphate) and the evolution of chlorine; 2d, Decomposition of the salt cake by charcoal and lime, resulting in the formation of black ash (crude sodic carbonate); and 3d, Separation of soda ash (common alkali) by lixiviation of the black ash. The essential raw materials for these processes are common salt, sulphuric acid, coal, and lime; but in practice alkali manufacturers prepare from pyrites their own sulphuric acid, which in the case of cupreous pyrites, after burning or exhaustion of the sulphurous constituents, are always passed on to the copper-works for treatment by the wet or Henderson process for copper extraction (see COPPER). With these materials, the following are the products of the manufacture in its extended sense—*i.e.*, tracing each raw material to its ultimate product. *Products.*—Iron, COPPER, silver, gold, SULPHURIC ACID, HYDROCHLORIC ACID, BLEACHING POWDER, chlorate of potash, calcic chloride, SULPHATE OF SODA, CARBONATE AND BICARBONATE OF SODA, CAUSTIC SODA, hyposulphite of sodium, phosphate of sodium, Epsom salts, SULPHUR, sulphate of copper. *Regenerated Products.*—MANGANESE, SULPHUR (partly), nitre, used in acid manufacture (part of). *Waste Products.*—Chloride of calcium, lime, sulphur (partly). The important and leading alkali trade-products in this list are printed in capitals.

Decomposition of Salt.—Sulphuric acid, acting on common salt with the aid of heat, decomposes the salt with the evolution of chlorine, and entering into combination with the soda, forms sodic sulphate or salt cake. The reaction is represented thus:—



$$\underset{\text{Sulphuric Acid.}}{H_2SO_4} + \underset{\text{Salt.}}{2NaCl} = \underset{\text{Sodic Sulphate.}}{Na_2SO_4} + \underset{\text{Hydrochloric Acid.}}{2HCl}$$

The hydrochloric acid fumes, which were originally allowed to escape into the air, and thus permitted to work havoc with surrounding vegetation, are saved for use in the bleaching powder manufacture. Indeed, alkali-works are now compelled by Act of Parliament to condense the whole of their hydrochloric acid fumes. The decomposition of the salt is effected in two stages. The charge of salt and sulphuric acid is introduced into an iron pot, covered so as to keep the product free from the action of atmospheric air, over and around which the fire from a furnace plays. By this means about two-thirds of the hydrochloric acid are driven off, and pass on to the condensing towers. The pot cover has two openings, one for charging, and the other for passing on the charge to the muffle or roaster, in which the remainder of the chlorine is expelled, and the formation of the salt cake completed. The muffle is an oblong chamber, over the roof of which the furnace fire plays, and passes round and under the bed on which the charge is placed. The charge of a salt-cake furnace varies from 5 to 18 cwts. of salt, about half a ton being a convenient amount, and the quantity of sulphuric acid used weighs only a little less. From 100 parts of salt about 62 parts of dry hydrochloric acid and 116 parts of salt cake are obtained. Within the past few years an important modified process of producing salt cake has been introduced by Mr. Hargreaves of Widnes, in which the direct use of sulphuric acid is dispensed with. By means of sulphurous acid obtained by burning pyrites, together with air and steam acting on salt kneaded into small cakes with a little water, the salt cake is produced direct at a temperature of 800° or 900° F.

Formation of Black Ash.—For this, the second stage, the salt cake is mixed with the same weight of lime, and half as much of small coal. The decomposition of these materials resulting in the formation of the crude sodic carbonate, with sulphide and carbonate of lime, &c., was formerly conducted in ordinary reverberatory furnaces; but now revolving furnaces in the form of huge brick-lined iron cylinders, turning on bearing-wheels, are generally employed. The first successful form was devised by Messrs. Elliot and Russell, but it has been subsequently much improved by Mr. James Mactear of St. Rollox, Glasgow. In the 'balling,' as this process is termed, Mr. Mactear has introduced other very important improvements. By adding to the furnaces before the completion of the process a quantity of caustic lime in small fragments, a larger proportion of caustic soda in the finished balls is obtained, the yield of soda is increased, and the total amount of lime used and the consequent waste are much lessened.

Separation of Soda Ash.—The black ash or ball soda obtained in the previous process is a very mixed substance, its principal constituents being sodic carbonate and caustic soda, with sulphide and carbonate of lime and caustic lime, unburnt coal, and other impurities. From this the soda compounds are separated

by taking advantage of their solubility in water. The balls, when cool, are broken into large pieces and placed in vats, where, when water is added, they disintegrate and yield up their solid constituents. The resulting liquid is of a dirty greenish-blue colour, and the residue when thoroughly exhausted forms soda waste, of which enormous heaps surround every long-established alkali-work. The liquor is evaporated to dryness, and the residue, calcined in a furnace, forms crude soda ash, containing proportions of caustic soda and sulphate of soda, which are eliminated by a process termed calking or carbonating. The crude ash is mixed with about its own weight of sawdust or small coal, and recalcined in a reverberatory furnace, when the sulphur is burned off and a large proportion of the caustic soda is carbonated. Continual stirring is required in this process, and by means of a rotary furnace invented by Mr. Mactear this laborious manual operation is superseded by mechanical stirrers, and at the same time a superior 'finished ash' is produced. White ash is obtained by again dissolving and evaporating the finished ash.

Soda Crystals and Bicarbonate.—Though a considerable proportion of the product of the S. M. is sold and used in the form of 'ash' or alkali for many purposes, the manufacture has to be carried further and presented in different forms. To obtain soda crystals (ordinary washing soda) the white ash is dissolved in nearly boiling water, and the strong solution is filtered through calico into settling vats, where a little lime and bleaching powder are added. After settling and cooling to 92° F., it is run into iron coolers, where the crystals form on the surface. From this they are taken, broken up, dried, and packed in barrels, and the remaining mother liquor yields, on evaporation, a weak ash. From soda crystals, bicarbonate (known vulgarly as baking soda) is prepared by exposure to an atmosphere of carbonic acid.

Caustic Soda.—This substance, now largely employed in the paper manufacture, is made principally by boiling and evaporating weak *vat liquors* (*i.e.* black-ash solutions) with caustic lime. As the evaporation proceeds, various salts precipitate and are removed, and at a certain stage, if *cream* or *unfused* caustic is desired, the evaporation is stopped. If, however, *white* or *fused* caustic is desired, the evaporation is completed, and the caustic soda presents itself in the form of a red-hot molten mass, which is ladled into iron drums, and soldered up to exclude all air. A certain amount of caustic is also obtained from 'red liquor,' the drainings from soda ash which in its preparation have not been evaporated to dryness.

Various other methods for preparing sodic carbonate have been suggested, and some of them have been carried out on a manufacturing scale. Among them the most important is the ammonia process, in which the action of ammonia and carbonic acid on a concentrated brine of common salt produces decomposition, resulting in the formation of sodic carbonate and chloride of ammonium (see AMMONIAC). Soda has also been prepared from the mineral cryolite (a compound fluoride of aluminium and sodium), and from sodic nitrate (common nitre).

Waste and Bye-Products.—The most important collateral product of the S. M. is Bleaching Powder (q. v.), in the preparation of which a great proportion of the hydrochloric acid evolved in the S. M. is utilised. But since manufacturers have been compelled by law to save all their hydrochloric acid, much difficulty has been experienced in finding a use for the whole of that material; and the enormous accumulations of soda waste have also created serious troubles. The waste-heaps contain practically all the sulphur used in the manufacture, and the sulphuretted hydrogen evolved from the heaps gives out an almost intolerable stench. To recover that sulphur has long been an object of much importance, from an economical as well as a sanitary point of view, and the first really successful plan for accomplishing that object was devised by Ludwig Mond, but it has since been much improved by Mr. Mactear. The process essentially consists in treating the liquor which drains from the waste-heaps with hydrochloric acid while hot, whereby pure sulphur separates from it in a finely divided condition, and the waste substance left—a solution of chloride of calcium—is quite harmless.

So'da-Wa'ter. See ÆRATED WATERS.

So'dium (Na=23), the most widely distributed of the metals of the alkalies, occurs as a constituent in many of our most important chemical compounds, such as common salt, caustic soda, carbonate of soda (popularly known as soda), &c. In rock-salt, sea-water, salt-springs, &c., large quantities of the chloride or common salt exist; and though sulphates, carbonates, borates, and silicates occur as minerals or in solution, this is the great source of the various compounds of S. used in the arts. Evaporation of sea-water is one of the chief methods for separating the salt in the form of crystals. Prepared in this way, various impurities, such as the chlorides of potassium, calcium, and magnesium, &c., exist in the resulting solid; and to the presence of these the deliquescence of table-salt is largely due. The chemical operations by which common salt is utilised for the production of the other compounds of S. are noticed under SODA MANUFACTURE.

Metallic S. is a soft silver-white metal resembling potassium in many of its properties. It melts at 97°·6C, and rapidly oxidises when exposed to the air at ordinary temperatures. It is lighter than water (specific gravity ·972), and when placed on the surface of this liquid, it decomposes it with great violence, forming caustic soda and evolving hydrogen. It does not take fire, however, unless its motions are restrained or the water is hot. It burns in air with a characteristic yellow flame, common to most of its compounds. Two *oxides*, the monoxide and dioxide, are known, and are produced simultaneously when the metal is burned in air. The dioxide (Na_2O_2), obtained separately by exposing S. to a current of dry air at a temperature of 200° C., is of small interest. It is white when pure, dissolves in water without decomposition, and crystallises by evaporation from solution of eight molecules of water. When exposed to a high temperature it loses oxygen and becomes transformed into the monoxide (Na_2O), which is a grey solid melting at a red heat and hardly volatilisable. This anhydrous oxide is a powerful base, and unites with water to form a soluble hydrate (NaOH) which cannot be decomposed by heat. This hydrate or caustic soda, however, is usually prepared as described under SODA MANUFACTURE. For long it was believed to be an elementary substance, and it was by electrolytic decomposition of this compound that Davy first obtained S. in the metallic state, shortly after he had similarly effected the decomposition of caustic potash (see POTASSIUM). Caustic soda is highly alkaline, and in solution is a powerful solvent for animal matter. It is of great importance in the manufacture of Soap (q. v.). The *chloride* (NaCl) or common salt is familiar to all. It is very soluble in water, and its solubility is little affected by temperature; it is slightly soluble in spirits of wine, but insoluble in pure alcohol. The *nitrate* ($NaNO_3$), known as cubic nitre or Chili saltpetre, occurs native and in enormous quantities at Tarapaca in Northern Peru (see NITRE). The carbonates are noticed under SODA MANUFACTURE. The *sulphate* or Glauber's salt ($Na_2SO_4 10H_2O$) is an intermediate product in the preparation of the carbonate, from which it may be obtained directly by the action of dilute sulphuric acid. It crystallises in rhombic prisms, and is present in certain mineral waters, such as those of Cheltenham. Borax (q. v.) is the *borate* of S. The other compounds, the phosphates, sulphites, &c., are all obtained as bye-products in the manufacture of the carbonate, and possess little general interest save as medicinal preparations.

Medicinal properties of Soda Compounds.—*Caustic* soda is used in medicine as a caustic for the destruction of tumours and ulcerating sores. *Liquor* soda is prescribed in preference to potash in certain affections of the stomach, in doses of ½ to 1 drachm. *Tartrate* of soda and *potash*, or *Rochelle salt*, is a mild, cooling purgative, and is given in doses from 2 to 4 drachms (see SEIDLITZ POWDERS). *Arseniate* of soda resembles arsenite of potash or Fowler's solution in its properties, and is prescribed as an antiperiodic and in skin diseases; dose $\frac{1}{16}$ to $\frac{1}{12}$ of a grain (see ARSENIOUS ACID). *Biborate* of soda, or Borax (q. v.), is employed as a refrigerant and diuretic, and as an emmenagogue, in combination with Ergot (q. v.). It is also applied externally in skin diseases, and especially in pityriasis versicolor; dose 5 to 30 grains.

The *Bicarbonate* is employed as an antacid and alterative; dose, from 10 to 30 grains. A saturated solution is an excellent application to the stings of wasps and gnats. *Carbonate* of soda is antacid, antilithic, and resolvent, and is given in such diseases as gout and dyspepsia, in doses of from 10 to 30 grains in bitter infusion. *Solution of Chlorinated* soda is used internally in cases of typhus, scarlatina, dysentery, dyspepsia, and also in glandular

enlargement and chronic mucous discharges. Externally, it is applied as an antiseptic, and as a gargle in the proportion of 4 to 6 drms. in 12 oz. of water. It is a powerful disinfecting agent, and is used in preference to chloride of lime; dose, from 10 to 20 minims. Soda *Hypophosphis* is given in doses of 5 to 10 grains as a nervine tonic. *Phosphate* of soda, sometimes called *tasteless aperient salt*, is a mild purgative, and is adapted to children and those of a delicate stomach; dose, ½ to 1 oz., in gruel or weak broth. *Sulphate* of soda, or Glauber's salt, is an excellent cooling aperient, and may be given in doses of ½ to 1 oz. *Sulphite* of soda is given in cases of *Sarcina Ventriculi* (q. v.), in doses of from 10 to 60 grains; and *Hyposulphite* of soda in similar doses for the same disease, also in scrofulous, syphilitic and rheumatic affections. Soda *Muriate*, or *common salt*, is best known for its antiseptic properties; dose, 10 to 60 grains as a tonic; 120 to 240 grains as a cathartic.

Sod'om (Heb., meaning unknown) **and Gomor'rah** (Heb. *g'morrah*, probably 'submersion') were the two principal cities of the five which at one time occupied the plain of Siddim, afterwards covered by the Dead Sea (Gen. xiv. 3). The account which is given of the destruction of those cities in Gen. xix. may be mixed with legendary matter, but there is probably preserved in it the tradition of a real catastrophe which overtook the region. The cities are elsewhere in the Bible spoken of as having been overwhelmed, as if by an earthquake (Jer. xx. 16, xlix. 18, l. 40), a phenomenon which was not unknown in Palestine (Amos i. 1; Zech. xiv. 5). As late as 1837 the town of Zidon or Saide was partially destroyed by an earthquake.

Sod'om, Apple of, is a gall formed on the twigs of (apparently) *Quercus cerris* (see OAK) by an hymenopterous insect, named by Westwood *Cynips insana*. The galls are rather more than an inch in diameter, of a varnished purple colour externally, with a soft spongy interior, and are stated by some writers to be the 'apples of S.' mentioned by Strabo, Josephus, and others, as tempting to the eye, but filling the mouth with bitter ashes if tasted. The name, together with that of Mad apple and Jew's apple, is also used for the fruit of several species of *Solanum* (q. v.).

Sod'omy, an unnatural crime receiving its name from the city of Sodom, whose inhabitants were apparently (Gen. xix.) addicted to it. It is punishable by the law of England with penal servitude for life; by the law of Scotland it is still a capital offence, though it is never punished except by penal servitude.

Soest, a town of the province of Westfalen, Prussia, 34 miles S.E. of Munster by rail, was once a Hanse town, and one of the most important places in Germany, with a population of between 30,000 and 40,000, but has declined since the Thirty Years' War. Its city law (*Jus Susatense*) was the model for that of many other cities, such as Hamburg, Lübeck, &c. The remains of its walls with their thirty-six towers are still to be seen. It has a great number of old churches, of which seven are now in use, the cathedral being Catholic and the remaining six Protestant. S. is the centre of a rich agricultural district, and has chemical works and extensive breweries. Pop. (1875) 13,122.

Sofa'la, a region in S.E. Africa, forming the southern half of the Portuguese colony of Mozambique (q. v.), and extending from the river Zambese to Delagoa Bay. Up the Zambese the Portuguese authority, such as it is, reaches as far as Zumbo, 400 miles from the mouth of the river, but the inland boundary of S. is elsewhere regarded as a mountain range running parallel to the coast at a distance of 100–150 miles. Practically, however, the Portuguese possess no authority beyond their settlements, though S., the oldest of these, dates from 1500. The chief settlements are:—Tete and Senna, on the Zambese; S., at the mouth of a river of the same name; Inhambane, on the coast, just outside the tropic of Capricorn; and Lourenço Marques, on Delagoa Bay. S. is a low, swampy, and densely-wooded region, with a very hot, moist, and pestiferous climate. Its productions are the same as those of Mozambique generally. Gold is no longer obtained, though in ancient times it was exported in large quantities, and some scholars claim for S. identity with the Ophir of Scripture. The prevalence of the tsetse fly renders cattle-rearing impossible, but elephants, hippopotami, and antelopes abound. The inhabitants are negroes, who gradually merge into the higher type of the Zulu in the S. None but a purely conjectural estimate can be formed of the pop. of the territory.

Sofi'a, or **Sophi'a** (Bulgar. *Triaditsa*, Turk. *Sofiá*), a fortified town of the principality of Bulgaria, of which it was formerly the capital, lies in a fertile plain on the upper waters of the Isker, an affluent of the Danube, to the N. of the Vitsch mountains, 75 miles N.W. of Philippopolis by rail. The seat of a Greek metropolitan and a Roman Catholic bishop, it has 44 mosques, 22 minarets, 15 Christian churches, 3 synagogues, &c. S. is the converging point of several important trade routes (three from the Balkans), and carries on considerable manufactures of cloth, silk wares, leather, and tobacco. S. is a fortress of great strength, but military opinion differs greatly as to its value as a check on the eastern passes of the Balkans. Pop. 18,000, mostly Bulgarians, Turks, Jews, and Gypsies. In the vicinity are celebrated hot springs, with a temperature of 48° C. S. occupies the site of old Sardica, which was built by Justinian. It was taken from the Byzantine emperor Basilios in 987 by the Bulgarians, who called it Triaditza, a name which gave place at the time of the Crusades to that of Stralitz or Sternitz. It fell to the Turks in 1382. During the Russo-Turkish war of 1877–78, the abandonment of S. became necessary as soon as a considerable Russian force had made its way S. of the Balkans, and the retreat was effected without loss. At the Congress of Berlin (July 1878), the English plenipotentiaries strove to join the town and district of S. to the province of Eastern Rumelia (q. v.), but they were eventually included in Bulgaria. On October 25, 1878, S. became the seat of government of Bulgaria.

Soft'as (Arab. 'burnt,' *i.e.*, with zeal for knowledge), a name given to the students in the Mohammedan colleges (*Medresse*), where they are taught theology and jurisprudence, and from which they pass into the Ulemas, taking their place among the imaums, muftis, or cadis. Their dress is a large white turban, and a long robe reaching nearly to the ground. In May 1876 a demonstration of these S. caused the downfall of the Grand Vizier Mahmoud Pasha, shortly followed by the deposition of Sultan Abdul Aziz; and after the outbreak of hostilities with Servia and Montenegro, they formed from among their own number a battalion of volunteers to take part in the 'holy' war.

Soft'ening. See RAMOLLISSEMENT.

Soft-Grass (*Holcus*), a genus of grasses of the tribe *Aveneæ* taking their name from the soft downy herbage of the common British species, *H. lanatus* and *H. mollis*. The first of these grows naturally in meadows, pastures, by waysides, &c., with a marked partiality for damp, peaty soil. It is of little value, however, for either hay or pasture, notwithstanding the large yield, as cattle and horses have a decided aversion to it. *H. mollis* is usually more slender, with a strong creeping root, and is a less frequent plant than the preceding. The only quality recommending it to cultivation is, that the roots serve to bind dry sandy slopes and embankments.

Soignies, a town of Belgium, province of Hainault, on the Senne, 22 miles S.W. of Brussels by rail, with a monastery dating from the 7th c. It has breweries and distilleries, and there are large quarries in its neighbourhood. Pop. (1870) 6873. To the N.E. is the forest of the same name (now a pleasure-ground for the inhabitants of Brussels), through which the British army marched to the field of Waterloo.

Soils consist of that part of the disintegrated surface of the earth's crust in which the roots of plants ramify, and from which growing plants derive the mineral substances necessary for their proper development. S. are formed by the disintegration of the rocks through the continued action of water and air at various temperatures, and by the accumulation of the decaying remains of vegetable organisms. In the process of disintegration water acts variously, as in the bursting action of frost, the gradual wear of running water, and the sawing, grinding, and dashing of the glacier and mountain torrent. The action of the atmosphere is dependent upon the carbonic acid which it contains. This acid is capable of decomposing the silicates of potash and soda, which form part of rocks, seizing the potash and soda, and converting the same into carbonates, which are subsequently washed out by water. Besides carbonic acid, chloride of sodium, or common salt, possesses a very powerful solvent action, having in solution the power of dissolving the phosphates of the alkaline earths. The tendency of water and atmosphere combined is to level the earth's surface by destroying eminences and filling up hollows. We often find, therefore, in the plains a soil differ-

ing widely from its underlying stratum, on account of its being a mixture of the deposits of streams and the debris of neighbouring or more distant mountains. On hills the soil is usually of the same nature as the subsoil. Organic matter comes first in the very humble form of lichens and other plants which obtain their nutriment almost entirely from the air, and in water-plants. As generations grow up and decay, the land slowly increases in organic matter. In proportion as this increase proceeds, the soil acquires the power of retaining those substances necessary for higher vegetable life which were before washed out; and when a soil once possesses the power of retaining all the soluble products of the decomposition of its mineral constituents, other circumstances being favourable, its advance in fertility is more rapid, as not only is the carbonic acid of the air still acting on the as yet undecomposed parts, but the decomposition of vegetable matter, besides keeping the soil in possession of its power of retaining the parts rendered soluble, furnishes a constant supply of carbonic acid within the soil, thereby accelerating decomposition. Thus land left to itself would eventually be covered with a luxuriant vegetation in the form of forests and prairies, through which animals would multiply and increase; and far from the soil becoming poorer, it would become more and more fertile; for in death and decay both animals and vegetables would return to the soil all they had taken from it, in a form more suited for assimilation by plants.

The nature of S. in old civilised countries depends—1, On the character of the rocks from which they were formed; 2, the nature and direction of the waters that may have flowed over them; 3, the amount of weathering they have received; and, 4, the length of time they have been under cultivation, and the nature of that cultivation. A soil may be unproductive through being of such a physical character as not to suit the roots of those plants which we wish to cultivate; through not being able to retain sufficient water for the requirements of plants during drought; through containing principles injurious to the health of plants; through its pores being stopped by water, thereby preventing the entrance of air and carbonic acid; and through not containing a sufficient quantity of those mineral constituents which the plant requires, in a form adapted for assimilation.

S. may be characterised by their prevailing primitive earths: hence, they are reduced to sands and gravels, clays, chalky and limestone S., alluvial S., and peat-bogs. *Sandy* S. are loose, never present a firm surface, and from being without cohesion are incapable of retaining moisture. Being readily permeable by both water and air, they powerfully promote the decomposition of organic matter, whilst they as readily permit it to be washed away by rains, or to escape in the form of gas. One great advantage they possess is their natural warmth; and being loose and friable on the surface, they are well adapted for the germination of seeds. To be made to approach alluvial S., clay and calcareous earth must be added. *Gravelly* S. are more readily penetrated by rain, and more readily dried by filtration and evaporation, than sands. They may be improved in the same manner. *Clayey* soil, relatively to water, is the very reverse of sand; relatively to heat, clays do not admit the atmosphere between their particles, and an unimproved clay soil is therefore a cold one. The obvious way to improve such is by the addition of sand and gravel, and, when the clay does not contain lime, by the addition of that material. *Lime and chalk* soil is much less common than either sand or clay. It may be improved by the laying on of these in sufficient quantity to destroy the tenacity and compactness of its texture. *Alluvial* S. are composed of very fine particles of the debris of several kinds of rocks, which have been held in suspension by water, and deposited in plains or along the banks of rivers, along with organic matter also held in suspension. The earthy character of this soil must necessarily always partake of the character of the rocks of the country in which it is found. *Peat* or *bog* is composed of partially decayed vegetable matter, soft, light, and spongy to the touch. It holds water like a sponge, so that in its natural state it is quite unfit for the growth of crops. *Carbon* in soils is found in various states of decomposition, from recent woody fibre to *humus*, which is woody fibre in a state of decay. *Magnesia* is not very common in soils. *Iron* is present in almost all soils, but is never very abundant in those naturally fertile. The proportion of *organic matter* varies exceedingly in different soils. The mixture of various earths and humus, termed *loams*, constitutes the best of soils. These are classified according to the earths which prevail in them, as a sandy loam, &c.; according to their degree of friability, as a free loam, a stiff loam, &c.; or according to both, as a free calcareous loam, &c. They are generally laid on the sides of valleys, along the bases of hills or mountains, or on the banks of upland rivers. In general, much more depends on the texture of a soil, and on its capacity for retaining or parting with water and heat, than on its chemical composition. Next in importance to the texture of a soil is the nature of the *subsoil* or substratum on which it rests. The best subsoils are those of clay resting on gravel or porous rock; the worst are those of clay kept moist by subterraneous water. The surface of the soil, in its level or incline, in its aspect and in its colour, has necessarily considerable influence on its fertility, and its maturing power of the produce which grows on it. S. are improved by draining, irrigation, manuring, pulverising, burning, fallowing, resting, and the order in which crops succeed each other. See MANURE AND ROTATION OF CROPS.

Soissons (Lat. *Noviodunum*, afterwards *Augusta Suessionum*), a town of northern France, department of Aisne, on the river Aisne, 65 miles N.E. of Paris by rail. It is strongly fortified, and is regarded as the key of Paris. It is the seat of a bishop, and has a fine cathedral, completed in 1212. In its neighbourhood there is a large Deaf and Dumb Institute. S. has breweries and manufactures of linen, cotton, and woollen goods, potash, and chocolate. Here Clovis struck the last blow at the Roman power in Gaul by his victory over Syagrius in 486. After a short siege, October 1870, it was taken by the Germans on their march to Paris. Pop. (1876) 10,089.

So'koto, a kingdom of the Sudan, Africa, between Gando (q. v.) and Bornu (q. v.). It has an area of 117,000 sq. miles, and is fertile and populous, but unhealthy. The capital, also called S., is situated in the N.W., in the Houssa (q. v.) territory. It has 22,000 inhabitants, and an extensive trade in salt, silk, cotton goods, and leather manufactures. The important town of Kano (q. v.) is situated 200 miles S.E. of the town of S.

Solana'ceæ, or **Sola'neæ**, is a large order of monopetalous dicotyledons with exstipulate leaves; flowers regular, large, or small; calyx 5-fid; corolla 5-lobed, imbricate, plaited, or valvate in bud; stamens 5, often cohering; ovary 2-celled; ovules many, axile; fruit a capsule or berry. The properties are contradictory—the tribe *S.* containing many plants which yield valuable food products; and *Atropeæ*, a number of highly poisonous species. In some cases, certain parts of the plant have poisonous properties, while other parts are innocuous. Of the poisonous and narcotic category, the most important will be found detailed in articles BELLADONNA, HENBANE, MANDRAKE, THORN-APPLE, and TOBACCO. For some that possess a bitter principle like quinine see CESTRUM. For the pungent and stimulant group see CAPSICUM. For such as supply articles of diet, the Potato (q. v.) is by far the most important; see also EGG-APPLE, KANGAROO-APPLE, NIGHTSHADE, PHYSALIS, SOLANUM, and TOMATO. Of ornamental plants, Lycium, Petunia (q. v.), and Solandra are examples. S. comprises 60 genera and upwards of 1000 species of herbs, shrubs, or very rarely trees; natives of all tropical countries—more especially America—and a few reaching temperate climates. Three genera and 4 species are represented in the British flora.

So'lan Goose. See GANNET.

Sola'num, the type genus of *Solanaceæ*, consists of numerous species diffused over the globe, but especially prominent in the flora of S. America. Most are herbs or shrubs, a few only attaining to small trees; many are beset with sharp prickles. All are easily recognised by the rotate corolla and anthers opening by pores; the fruit is a berry with numerous seeds. For the most important species see POTATO, and for various others the articles BITTERSWEET, EGG-APPLE, KANGAROO-APPLE, and NIGHTSHADE. In addition to these, *S. Æthiopicum* is cultivated in tropical Africa and elsewhere for its edible fruit; *S. gilo* in tropical America for a like purpose; *S. Quitoense* of Ecuador and Peru produces a berry resembling a small orange in colour and taste; the large red spherical fruit of *S. Uporo* is used in many islands of the Pacific; and *S. vescum* is the 'Gunyang' of S.E. Australia. The berries of *S. Guinense* of the tropics of both hemispheres furnish a dye, particularly violet,

for silk; and *S. indigoferum* is cultivated in Brazil as a dye-shrub. The fruits of *S. saponaceum* are used in Peru as a substitute for soap, and *S. marginatum* has tanning properties. Many species are highly curious and ornamental. The Tomato (q. v.) was formerly called *S. Lycopersicum.*

So'lar Cy'cle is a period of twenty-eight years within which the first day of the years passes successively through the same sequence of week days. If there were no leap years, each new-year day would be a day later than the preceding one, and the S. C. would be simply seven years; but since every fourth year there is a break in the succession and one day is missed, twenty-eight or four times seven years must elapse before the successive new years begin to occur upon the same sequence of days. In the Gregorian calendar a break occurs in the S. C., since only the centuries which are divisible by 400 are leap years.

So'lar Mi'croscope. See MICROSCOPE.

So'lar Sys'tem is the material system of which the sun is the centre. To it belong the planets, planetoids, satellites, comets, and meteorites, which all directly or indirectly revolve round the central sun, the whole being bound together by the mutual attractions of the several parts. The telescope has revealed the S. S. to be a far more complex structure than was ever dreamed by astronomers of the last century. The larger planets now number nine, if we include the still doubtful Vulcan, and the most important of these are in themselves systems of great complexity, and yearly are asteroids being discovered and added to the catalogue of now close upon 200, while myriads of meteorites and comets stream round the sun, ultimately to be utilised as fuel to the great source of light and life. See ASTEROIDS, COMETS, PLANETS, SUN, &c.

Solas'ter, or Sun-Star. See STARFISH.

Sola'tium in Scotch law means compensation for wounded feelings, and is regarded as something distinct from mere pecuniary loss or damage. S. is not *formally* acknowledged as a ground of damages in English law.

Sol'der, an alloy used for uniting metals. It must be rather more fusible than the metals to be joined; consequently there are many different kinds of solders, the nature and relative proportions of whose constituents vary greatly. *Hard* solders are less fusible than *soft* solders, and are employed to join the more refractory metals. Silver 4 parts, and copper 1 part, fused together, form a very hard S. suitable for silver-work, gold, steel, and gun-metal. Tin and lead in equal parts make common soft S. for plumber's use. Borax, sal-ammoniac, chloride of zinc, or rosin, is always used with S. as a flux.

Sol'dier (French and German, *soldat*), in the common meaning of the term, one belonging to an organised body of troops in the military service of a government. Originally the name of S. was only applied to hired troops, as in Froissart's *Chronicles,* where it refers to the hired troops of France and Germany. The derivation is variously attributed to *soldurius* (Cæsar's *De Bello Gallico,* iii. 22), *solidus,* a Roman coin, which may have been a soldier's wages, and the French *soudoyer,* stipendiary. The word came into use in England in the reign of Edward I.

Soldier-Crab'. See HERMIT-CRAB.

Sole (*Solea*), a genus of *Pleuronectidæ* (q. v.) or flat fishes, in which the eyes and mouth are twisted to one side. The lower jaw is hidden by the skin, and there are several rows of teeth. The eyes and mouth are on the right side, which is the dark-coloured and uppermost surface. The scales are small and *placoid.* The common S. (*S. vulgaris*) is abundant on the British coasts, and is largely fished. The spawning season extends from February to the end of March, when the flesh becomes less palatable. The dorsal or anal fins are distinct from the tail-fin. Other species of S. are the *S. pegusa,* or Lemon French S., and the Little S. (*Monochirus linguatulus*). The Variegated S. (*S. variegata*) has a reddish-brown hue marked by darker bands. The transparent S. (*Achirus pellucidus*) is a Pacific species, in which pectoral fins are wanting. The Zebra S. of Japan (*S.* or *Brachirus Zebra*) is a species in which the body is very distinctly striped.

Sol'ecism, a term applied to violations of syntax or the laws of thought, and said to be derived from Soli, a city of Cilicia, whose Greek inhabitants, from their intercourse with the natives, had adopted many barbarisms into their speech (Diog. Laert. i. 2, § 4).

So'len, a genus of *Lamellibranchiate* molluscs notable for the length of the shells, whence the name 'razor-shells.' The *S. ensis* and *S. siliqua* are common species; the former is curved like a sword, the latter is straight. In the family *Solenidæ,* to which these molluscs belong, the shell gapes at either extremity. The ligament is external, and the hinge teeth number two or three. The siphons are short and united, and the foot is very large and powerful. The S. use the foot as a burrowing organ, and by its means descend in the sand so swiftly that their capture is a matter of extreme difficulty.

Solenho'fen Slate, an extremely fine-grained deposit, referable to the age of the Upper Oolite, and largely quarried near Aichstadt in Bavaria for lithographic purposes. It is of great scientific interest on account of the numerous and beautifully preserved fossils it has yielded: the latter include numerous insects, crustacea, fish, and saurians, and about eight species of pterodactyls, or flying reptiles. The most extraordinary fossil, however, is the wonderful bird *Archæopteryx macrura,* of which a fine specimen, found in 1862, is now in the British Museum. This, the oldest indication of bird-life with the exception of the ornithic footprints in the Trias of Connecticut, approaches the reptiles in many important characters; *e.g.,* in the possession of a long tail of twenty free vertebræ, each supporting a pair of quill-feathers.

So'lent, an arm of the sea separating the Isle of Wight on the N.W. from the mainland, where in August 1875 the *Mistletoe* was accidentally run down by H.M. private yacht *Alberta.* Breadth at the S.W. entrance, opposite Hurst Castle, less than a mile, elsewhere from 1½ to 2½ miles.

Soleure' (Ger. *Solothurn*), a canton of northern Switzerland, bounded on the S. and W. by Bern, on the E. by Aargau, and on the N. by Basel. It joined the Swiss Confederation in 1481, and its government consists of a Grand Council of 106 members chosen directly by the people, which again elects an executive of 5 members. The whole body of the people has also a veto on the acts of the Council. The area of S. is 353 sq. miles, and its pop. (1876) 77,803, mostly Roman Catholics. More than two-thirds of its surface belongs to the broken mountain-land of the Jura, but affords excellent pasturage. The arable land is very fertile, S. being one of the three cantons which grow more grain than they consume. The grape is also considerably cultivated, and there is a great trade in cherry-brandy. Flax and cotton are grown, and there are manufactures of iron, glass, watches, &c. S. has valuable marble and limestone quarries.—**S.,** capital of the canton of the same name, in Switzerland, on the river Aar, 25 miles N.N.E. of Bern by rail. It is one of the oldest towns in Switzerland. Its cathedral of St. Urs and Victor was completed in 1773. S. has a museum of natural history, a fine library, several art collections, and numerous higher schools, secular and ecclesiastical, and has an old armoury on the Weissenstein Mountain. It is a great centre of Swiss trade; in its neighbourhood is a well-known watering-place. Pop. (1870) 7054.

Solfa'taras (Ital.) are crevices or fissures in the earth from which gases are exhaled. They occur in volcanic regions, such as the S. of Italy, the Antilles, and the island of Java; and the exhalations are chiefly sulphuretted hydrogen together with traces of hydrochloric acid and chloride of ammonium.

Solfeggio (Ital.), a musical exercise on the notes of the musical scale, as represented by the syllables *do, re, mi, fa, so, la,* and *si.* The scale of C, requiring no alteration by sharps or flats on the pianoforte, gives the notes C, D, E, F, G, A, and B, as the equivalents to *do, re,* &c., respectively. According to modern practice, however, *do* may form the key-note of any scale, *re* forming the second note, and the other notes in order. In Mr. J. Curwen's Tonic Solfa System (see NOTATION, MUSICAL) the notes in all the scales starting from any one of the twelve semitones are called *doh, ray, me, fah, sole, lah,* and *te,* an English spelling being here introduced to correspond to the Italian pronunciation, and *si* being altered to *te* to prevent the repetition of the initial *d* used for *doh.* Many children are now taught singing according to this method, which has the advantage of overcoming some rudimentary difficulties, but which prevents

any acquaintance with the great range of musical literature. The intervals are taught from a musical chart called the Modulator. Monosyllables to represent the notes of the scale were first used by Guido d'Arezzo, a Benedictine monk born about 990, who was also the inventor of the horizontal lines forming the staff. The six notes he used were *ut*, *re*, *mi*, *fa*, *sol*, *la*, the first consonants of each line of an ecclesiastical hymn to St. John the Baptist—

'*Ut* queant laxis
*Re*sonare febris
*Mi*ra gestorum
*Fa*muli tuorum
*Sol*ve polluti
*La*bii reatum.'

The additional note *si* was introduced by Le Maire, a singing-master of Paris, about 1660, and the Italians for the greater sweetness changed the name of the first note *ut* into *do*.

Solferi'no, small village of Northern Italy, province of Mantua, 20 miles N.W. of Mantua, notable for the victories gained there by the French over the Austrians in 1796, and again under Napoleon III. on the 24th June 1859.

Soli'citor-Gen'eral of England is a law officer of the Crown, whose function it is to assist the Attorney-General (q. v.), the two having equal authority. The S.-G. of Scotland has the same function relative to the Lord Advocate. See ADVOCATE, LORD.

Soli'citor to the Treasury, in the United Kingdom, is an officer who acts as attorney for the Government in all legal proceedings, and for all the departments of Government for which no special solicitor has been appointed.

Soli'citors. See ATTORNEYS AND SOLICITORS.

Solidun'gula, or **Solipe'da.** See EQUIDÆ.

Sol'idus. See SOU.

Sol'ingen, a town of Rhenish Prussia, 19 miles N. of Köln by rail. Since early in the Middle Ages it has been famous for its hardware manufactures, especially for its swords. In its district there are over 2700 workshops, with 10,000 hands, in which are produced yearly about half a million sword-blades, two million dozen knives, a million dozen scissors, and numerous revolvers, iron tools, &c. Dam-~ening is very skilfully done here. Pop. (1875) 14,040.

Sol'is y Ribadeneira, Antonio de, born at Alcàlà de Henares, 18th July 1610, studied law and theology at Salamanca, and in his eighteenth year produced a comedy, *Amor y Obligacion*. Its success gained him a patron in the Count de Oropesa, Viceroy of Navarre and Valencia, from whose service he passed to the court of Madrid (1654). Here the Queen-Mother made him *Cronista Mayor* (1666); as such he wrote his *Historia de la Conquista de la America Septentrional* (Madr. 1684), whose 'copious and sustained eloquence places him,' says Ticknor, 'by the side of Mendoza and Mariana,' though in boldness and dignity their inferior. Among his comedies, *La Gitanilla de Madrid*, *Triumfos de Amor y Fortuna*, and *El Alcazar del Secreto*, are counted his masterpieces. Having taken the tonsure (1667), S. died at Madrid, 19th April 1686. There are French, Italian, and German versions of his *Historia*, and an English one by T. Townsend (Lond. 1824). See Ticknor's *History of Spanish Literature* (4th ed. 1871).

Solitaire', a game played by one person with marbles arranged geometrically in hollows on a board. One marble is removed from the board, and the empty hollow so made enables pieces to be captured singly after the manner of draughts. The object of the game is to 'take' the pieces in such an order that eventually only one piece will remain.

Sol'itaire (*Pezophaps*), a species of Rasorial birds, formerly inhabiting the islands of Bourbon and Rodriguez, but which has been exterminated by man within the past 300 years. The S. had rudimentary wings, and hence fell an easy prey to the early voyagers who visited these islands. Leguat, a French traveller, who gives an account of the bird, named it the 'S.' He states that some of the males weighed 45 lbs., and their plumage is described as darker than that of the females. The Dodo (q. v.) is an example of a nearly allied bird which was similarly exterminated in Mauritius.

Solmisa'tion, the art of giving the proper sound or pitch to the seven notes of the musical scale. See SOLFEGGIO.

So'lo (Ital. 'alone'), a musical movement in which only one voice or instrument is employed, or where other voices or instruments are only introduced for the sake of accompaniment.

Sol'omon (New Test. Greek, from Heb. *Shelomoh*, 'the peaceful one'), king of Israel, was the youngest son of David and Bathsheba (1 Chron. iii. 5). His education seems to have been entrusted to Nathan the prophet (2 Sam. xii. 25, the true reading of which is, 'And he (David) entrusted him to Nathan the prophet, who called him Jedidjah,' &c.). Although he was not properly David's heir, his mother used her influence with David, after the revolt and death of Absalom, to induce him to appoint S. his successor on the throne, to which the king consented (1 Kings i. 11-14). The plan was not carried out, however, without opposition, for not long before David's death, Adonijah, who was properly his heir, formed a conspiracy with Abiathar the high priest and Joab the commander-in-chief of the forces to seize the throne. But Bathsheba and her party, which included Zadok the other chief priest, Benaiah the rival of Joab, and Nathan, frustrated the plot by getting David to have S. crowned as his successor at once (1 Kings i. 5-40). This was about B.C. 1015, and the death of David followed immediately after.

S. is chiefly remarkable for three things: his great wealth, his wisdom, and the building of the Temple. 1. Anything like an exact estimate of his wealth is impossible, especially as any figures that are given are contradictory and evidently exaggerated (*e.g.*, the sum collected by David for the building of the Temple is called in one place (1 Chron. xxix. 4) 3000 talents of gold and 7000 of silver, and in another (xxii. 14) 100,000 talents of gold and 1,000,000 of silver), but a consideration of the sources from which it was derived will show how great it must have been. He inherited immense wealth from his father, which had been accumulated for the building of the Temple. The natural productions of the country were very valuable: cattle (reared in the rich trans-Jordanic pastures), grain, timber, stone, and probably the useful metals; and from those S. doubtless derived large revenues. He certainly did so from the commerce with other countries—Phœnicia, Egypt, Arabia, Babylonia, and Ophir (q. v.)—which he encouraged, and a great part of which seems to have been a monopoly in his own hands. It is said that besides other profits from this trade, and revenues from the provinces, there came into the king's treasury annually 666 talents' weight of gold (which was equal to at least £3,646,000 sterling), while silver was thought no more of in Jerusalem than stones, or cedar than the commonest timber (1 Kings x. 14-27). 2. S. was not more celebrated for his wealth than for his wisdom (1 Kings x.). According to 1 Kings iii., that wisdom was of a distinctly religious type, and was closely connected with the worship of Jehovah and obedience to his commandments; but this may have been the idea of a later time, as the writer of Kings lived many centuries after S. In the time of S., Wisdom meant every kind of penetration, or even cunning (*cf.* 2 Sam. xiii. 3, xiv. 2, xx. 16; 1 Kings ii. 6, 9). There was a class of men in Israel called 'sages,' who made riddles and proverbs, and, sitting in the gate, gave advice and uttered warnings and lessons of practical wisdom. These justly regarded S. as their great prototype. 3. But that which raised S. so high in the eyes of posterity was undoubtedly his building the Temple, which was begun in the fourth year of his reign, and completed in seven and a half years. Some think that his motive for executing this work was not merely a desire to honour the pure worship of Jehovah. Political reasons—*e.g.*, his foreseeing that a concourse of pilgrims to the capital three times a year would strengthen the unity of his kingdom—probably also mingled with the religious motive. Other magnificent buildings erected by him were a palace on Mount Zion; an audience-hall, built chiefly of cedar, and hence called 'the house of Lebanon;' a palace for his principal wife, who was a daughter of the king of Egypt; sanctuaries for the deities worshipped by the surrounding nations; &c. The furnishing of these buildings was on an equally magnificent scale. But all this magnificence cost the people dear in the shape of taxes and unrequited labour, and bred a great deal of discontent (1 Kings v. 13-16). This gave rise to a threatened rebellion of the northern tribes; a disaster which was averted at this time, but after the death of S. led to

the disruption of the kingdom. The historian represents this, as well as the attacks of Hadad the son of the last king of Edom, and of Rezon king of Syria, as a punishment for the king's toleration of idolatry in his old age. But there were sufficiently powerful natural causes at work to produce the internal disaffection (*cf.* 1 Kings xii. 1-17), while Hadad and Rezon had caused him trouble from the beginning of his reign (*cf.* 1 Kings xi. 21-25). His reign lasted forty years. Hardly any monarch in history has a more splendid fame than S., yet it is clear as noonday that his magnificence was a curse to his country, and that he himself had no political insight, nor the faintest comprehension of the means by which national welfare is nurtured and maintained. He does not, therefore, belong to the truly great rulers of mankind. We must go to the East for his counterpart, and we find it there in sovereigns like Harun-al-Raschid, Shan Jehan, and Aurungzib. He had a rich, glowing, sensuous, Oriental genius, and lived the best part of his life in luxurious and debasing joys, but in those hours saved from the distractions of the state and the pleasures of the harem, his deeper nature found a remorseful vent in a wisdom that is sometimes cynical, and often sad. Yet he is never irreligious. He does not, like some baser spirits of modern times, make his own vices and errors the ground for blasphemously challenging the Divine Righteousness; on the contrary, these seem to awaken in him a mournful sense of lost ideals which he feels himself impelled to cherish and commend.

Sol'omon Islands, a chain of magnificent but little-known islands in Melanesia, stretching S.E. from New Britain to the Santa Cruz group, between 4°30′ and 11°30′ S. lat. The islands number about 140, and some of them are from 50 to 80 miles long. Area, 12,157 sq. miles. They are mountainous, densely wooded, and populous, but the natives are cannibals, and very hostile to strangers. The S. I. were discovered by Mendana in 1567, and owe their name to the belief of the Spaniards that it was from them that Solomon fetched gold to adorn the Temple at Jerusalem.

Sol'omon's Seal, a name given to *Polygonatum multiflorum* from the scars upon its rootstock resembling a six-pointed star, the S. S. of Oriental tales; it is now used as the English name for this genus of the tribe *Asparagineæ* of *Liliaceæ*. The genus is closely allied to *Convallaria* (see LILY OF THE VALLEY), differing therefrom in the stem being leafy, and the six-cleft flower being tubular instead of globose. There are about twenty species, occurring in Europe, N. Asia, Himalaya, and N. America. Of these, three are British, but *P. officinalis* and *P. verticillata* are respectively rare, and very rare. The above-mentioned *P. multiflorum* is found in woods, more particularly in the southern half of England. Its rhizome grated or scraped into a pulp is a provincial application to black eyes and other bruises to remove discoloration.

So'lon, the greatest of Athenian legislators, and one of the seven wise men of Greece, was the son of Execestides, and was born, probably at Athens, in 638 B.C. His father's extravagance and his own love of adventure induced him to travel as a foreign trader for some years. When a youth he began to write poetry, at first of an amatory nature, but latterly more philosophical. His earliest public appearance was on the Agora, where he recited a poem protesting to his townsmen against the abandonment of their claim to Salamis. Supported by Peisistratos, then his friend, S. captured the town of Salamis, and, soon after, Sparta; made arbitrator between Megara and Athens, awarded the island to the latter, S. interpolating a line in the *Iliad* to make good his claim. For some time he continued to rise in public favour, and declaimed in his poems, with impartial anxiety, against the divisions of the city and the state of the Attic peasantry, who were crushed with debt. In 594 he was made Archon, with extraordinary powers, and entrusted with the introduction of reforms. Disdaining to seize the despotism, he enacted the *Seisachtheia*, or 'Disburthening Ordinance,' to relieve the poor from the pressure of debt. It forbad the pledging of person, family, or lands as security for debts; cancelled contracts in which this had been done, and freed debtors then in exile or slavery. Its other provisions are less clearly known; some say it fixed a legal maximum rate of interest. S. accompanied it with a debasement of the coinage, to aid wealthy debtors whom it did not reach. The effects of these measures were immediate, extensive, and permanent, and S. was therefore entrusted with the readjustment of political power. For the Eupatrids or hereditary nobility, who had hitherto exercised supreme authority, he substituted a plutocracy. The whole state was divided into four classes—(1) those with incomes of 500 drachmæ (or medimni in grain); (2) those with incomes of between 500 and 300; (3) those with incomes between 200 and 300; (4) the rest. There were proportionate burdens and rights to each class. To check the newly-formed democracy, S. increased the powers of the previously existing aristocratic 'Senate of the Areopagus.' He also instituted a new council of 400—elected by the people—called the Boulē. The object of this new council is much disputed; some view it as the regulator, others as but a tool, of the great body of Athenian electors. S. also drew up an extensive code of laws. After completing his task, he left Athens for ten years' travel, visiting Egypt and Cyprus. Herodotus gives a dramatic but improbable story of a visit he paid to Crœsus. On his return disputes had broken out afresh among the citizens, and his quondam friend Peisistratos managed to make himself tyrant, thus breaking the Solonian constitution. Yet many of S.'s beneficent laws long continued in force, as his rearrangement of the calendar, his imposition of mutual obligations on parents and children, his various restrictions on public morality, and his protective regulations. S. died about 558 B.C., and his ashes were, according to his wish, scattered round the island of Salamis. According to Grote, 'S. represents the best tendencies of his age combined with much that is personally excellent; the improved ethical sensibility; the thirst for enlarged knowledge and observation, . . . the conception of regularised popular institutions, . . . a genuine and reflecting sympathy with the mass of the poor, . . . lastly, during his temporary possession of a power altogether arbitrary, . . . an absence of all selfish ambition, and 'a rare discretion in seizing the mean between conflicting exigencies.' See Plutarch's and Diogenes' Lives; and Thirlwall's and Grote's Histories. His poetical fragments are collected in Bergk's *Poetæ Lyrici Græci* (1866).

Solor' Islands, a group of four E. Indian islands, lying E. of Flores (q. v.). The chief are—S., area, 105 sq. miles; pop. 15,000; Adanara (or Adonare), area, 302 sq. miles, pop. 36,000; Lomblem, area, 520 sq. miles, pop. 120,000; Pantar, area, 275 sq. miles, pop. 60,000. The first three are inhabited by Malays, most of whom are Mohammedans; Pantar, by Papuans. Adonare is independent; the Dutch hold the others. The islands are fertile and their scenery picturesque. The natives on the coast engage much in fishing.

Sol'stice (Lat. *solstitium*, from *Sol*, 'the sun,' and *sto*, 'I stand') is the point in the ecliptic at which the sun is furthest from the equator. See ECLIPTIC.

Solu'tion. When by contact with a liquid the particles which compose a solid are drawn asunder and separated from each other so as no longer to be distinctly visible, the solid is said to be dissolved and a S. formed. The liquid which affects the transformation is called the solvent. The most important solvent we possess is water, which almost always contains foreign substances dissolved in it. Mineral springs, rivers, lakes, seas, the ocean itself, all are true solutions. Experiment proves that the less of a given solid which a solvent contains in S. the more rapidly will it dissolve more of the same; and that this dissolving action will go on until the S. is of a certain definite strength. Such a S., which has dissolved the greatest quantity of the solid possible in the circumstances, is said to be *saturated*. As a general rule, the powers of a liquid as a solvent increase with temperature, though to this there are some important exceptions, *e.g.*, the solutions of lime and its salts in water. Consequently, boiling usually hastens the process by which the solid is dissolved, and as the S. so prepared cools it may be unable to hold all the solid present in the dissolved state, when a precipitate at once appears. This *precipitation from cooling* is an important artifice in many chemical operations. In certain circumstances, however, it is possible to force a solvent to hold in S. a greater quantity than it naturally can. For instance, if a saturated S. of sulphate of soda be boiled so that part of the solvent is driven off, the S. still remains clear because of its high temperature. If the mouth of the vessel is stopped with some cotton wool, and the S. then allowed to cool, no precipitation takes place, and the S. is *supersaturated.* It is, how-

ever, essentially unstable, for if the cotton wool be removed and a crystal of sulphate of soda introduced, or even a particle of dust, at once crystallisation begins round the introduced crystal, and extends in all directions till the whole liquid becomes solidified. The action is accompanied with the evolution of heat. The various supersaturated solutions which have been investigated present remarkable differences as to their degree of instability; indeed, the whole subject of solutions is still very obscure. In certain cases of S. there is unquestionably a chemical action, the formation of a new compound, and when it is remembered that the chemical reactions of acids, bases, and salts, usually require these substances to be in a state of S., the importance of the subject from a purely chemical view-point can hardly be overestimated. It is one of the chief defects of the modern theories of chemical action that the influence of the solvent is in most cases entirely overlooked, when there can be no doubt that it is the presence of the solvent which renders the action possible. Zinc decomposes sulphuric acid only when the latter is more or less dilute, and the most important and strongest acids (nitric, hydrochloric, &c.) act but feebly when pure, and probably would not act at all if they could be obtained perfectly pure. For a thorough comprehension of the nature of solutions, the kinetic theory of gases must be greatly developed, and some clearer notion of the molecular constitution of bodies obtained than is at present possible.

Sol'vent. See SOLUTION.

Sol'way Firth, an arm of the Irish Sea, separating in one part England from Scotland, and extending inland in an easterly direction for 40 miles, with a breadth diminishing from 20 miles at its opening to 2 miles at the mouth of the Annan. It receives from the Scottish side the Urr, Dee, Nith, and Annan, and the Esk, with its feeder the Liddel; from the English, the Eden, Wampool, Ellen, and Derwent. Broad sands, dry at low water, occupy a large portion of the S. F., over which the tides ebb and flow with remarkable rapidity, sometimes advancing with a head 4-6 feet high at the rate of 8 or 10 miles an hour. —**S. Moss**, a district about 7 miles in circumference, belonging to Cumberland, lying W. of Longtown, and adjoining the Scottish border. Here the Scottish army of James V. was defeated by the English in 1542.

Sol'yman (Suleiman) **II.**, surnamed by the Turks Kanuni ('legislator'), and by Western writers 'The Magnificent,' the tenth and greatest of the Ottoman sultans, was born in 1495. The only son of Selim I., he had, unlike most Turkish princes, been early initiated into 'policy and war, and on his accession to the throne (September 1520) he hastened to carry out his ambitious schemes of conquest. In 1521 he invaded Hungary, and captured Belgrade, and the year after wrested Rhodes from the Knights of St. John. The next three years were occupied in suppressing a rebellion in Egypt and a revolt of the janissaries, but in 1526 he again overran Hungary, defeating its armies in the battle of Mohacz, in which King Lewis II. and 20,000 men were slain. S. now conferred the crown upon John Zapolya, the rival of Ferdinand of Austria, whose dominions he invaded in 1529, taking Buda and laying siege to Vienna, from which, however, he was obliged to retire after twenty unsuccessful assaults. He next carried his arms against Persia, and subdued in 1534 Armenia and Irak, with the cities of Tabriz and Bagdad. On his return to Constantinople in 1535 he concluded a treaty with François I., which gave the French the monopoly of commerce in the Levant. This alliance was cemented in consequence of the expeditions of Karl V. to Africa in 1535 and 1541, and the fleet of S., under the famous corsair Khair-ed-din, or Barbarossa, uniting with that of the French, swept the Mediterranean, ravaged the coasts of Italy, and pillaged Nice (1542). In 1547, S. concluded peace with Karl V. and Ferdinand, and next year led his army once more against Persia, while his lieutenants conquered Gozzo and Tripoli. In 1551 he acquired the Banat of Temesvar, after which he engaged in a third war with Persia, which was concluded by a peace in 1554. In 1553 his son Mustapha was sacrificed to the intrigues of his favourite wife Roxolana, whose son Bajazet fell a victim to his own ambition in 1559. In 1561 S. gained a brilliant naval victory over the Knights of St. John and the Spaniards, but failed in 1565 to take Malta after a siege of five months. In 1566 he led a final expedition against Hungary, and died during the night of the 5th September, while besieging the town of Szegedin, three days before its surrender. He was succeeded by his only surviving son, Selim II. See Ancillon, *Histoire de la Vie de S.* (Par. 1702); Von Hammer, *Geschichte des Osmanischen Reichs* (10 vols. Pesth, 1827-34); and Creasy's *History of the Ottoman Turks* (new ed. Lond. 1877).

Somâ'li Land, a little-known maritime region of E. Africa, forming a triangle of which Cape Guardafui is the apex. Its western boundary, dividing S. L. from Shoa and the Galla country, is uncertain, but is generally regarded as being formed by a line drawn from Zeyla on the Gulf of Aden to the head-waters of the river Jub, or Juba, and thence by the course of that stream to its mouth, on the equator. The coast usually consists of a belt of low flat land, which rises inland in terraces to a plateau from 4000 to 6000 feet high, which is in turn succeeded by mountains reaching a height of 9500 feet. The country is for the most part grassy and open, and abounds with elephants, giraffes, rhinoceroses, zebras, antelopes, ostriches, &c. The inhabitants, who are extremely fierce and uncivilised, are of mixed Abyssinian and Arab descent, and have a dark-brown complexion and fine physique. They are pastoral nomads, but their country possesses great undeveloped resources of coffee, cotton, gums, spices, hides, ivory, and ostrich feathers. The chief trading ports are Berberah and Zeyla, both on the Gulf of Aden, but the largest town is Harar (pop. 35,000), 175 miles S.W. of Zeyla. Berberah has an extensive annual fair, of very ancient date. Since 1873, at the request of the local chiefs, Egypt has exercised a protectorate over Berberah, and now claims possession of the country as far as 10° N. lat. The Mushah Islands, at the N. extremity of the Somâli coast, were ceded to Britain in 1840, and in 1862 the French purchased the neighbouring port of Obokh.

Sombrere'te, a town of Mexico, state of Zacatecas, 65 miles N.W. of the town of that name, is the centre of a silver-mining district, said to have contained the richest metallic veins ever discovered, but now almost worked out. Pop. 14,000.

Som'ers, John, Baron S. of Evesham, a celebrated English statesman, was born, probably 4th March 1652, at Worcester, where his father was an attorney. It was at first intended that he should adopt his father's profession, but in 1667 he entered Trinity College, Oxford, and in 1669 became a fellow of the Middle Temple, being called to the bar in 1676. He soon became known as a rising young lawyer and Whig politician. It was the Revolution which first brought him into real prominence. The Declaration of Rights was drawn up and presented by him, and he was a leading member of the convention Parliament. Under William III. he became successively Solicitor-General and Attorney-General, and in 1693 Lord Keeper of the Great Seal. In 1697 he was raised to the peerage, and made Lord Chancellor; but when the Tory influence shortly afterwards preponderated he was deprived of the seals (1700) and impeached by the House of Commons (1701), but ultimately acquitted by the House of Lords. The Whig reaction which followed Marlborough's first victories restored him to power, and he was instrumental in bringing about the union of England and Scotland in 1707. In 1710 he finally retired from office, and died 26th April 1716. Besides being a statesman of unusual acuteness and integrity, S. was a great orator, a sound lawyer, and a distinguished patron of literary men, such as Newton, Locke, Bayle, and Addison, the last of whom dedicated to him the first volume of the *Spectator*. S. was one of the first Englishmen to appreciate and assert the sovereign genius of Milton. A collection of state papers, from originals in his library, was edited under the title of the *S. Tracts* (1748-52), and a new edition was published by Sir Walter Scott (1809-15).

Som'erset Her'ald, one of the six heralds, composing, with the three Kings-of-Arms and the four Pursuivants, the Heralds' College of England.

Som'erset House, a fine quadrangular building in the Strand, London, the S. front with a noble façade facing the Victoria Embankment, used for various civil departments of the Government. It was erected in 1776-86, on the site of a palace of the Protector Somerset, from the designs of Sir William Chambers. There are 3600 windows in the building. About 600 Government officials are employed here daily, at an annual cost of £275,000. The principal departments accommodated are the Inland Revenue Office, the Registrar-General's Office,

the Audit Office, and the offices connected with Doctors' Commons. Postage-stamps, stamps on country bank-notes, and medicine-labels are printed in the establishment. The Royal and most of the other learned societies now accommodated at Burlington House had formerly their rooms here. The E. wing of the building is occupied by King's College.

Som'ersetshire, a county in the W. of England, on the S. side of the Bristol Channel. Area, 1641 sq. miles, or 1,049,815 acres; pop. (1871) 463,483. The Quantock, Polden, and Mendip Hills (q. v.) cross the country from S.E. to N.W. To the W. of the Quantocks is the hilly district which contains Brendon Hill and Exmoor (with Dunkery Beacon, 1668 feet high). Between the Quantocks and Polden Hill is the valley which the Tone and Parret drain into Bridgewater Bay, while E. of Polden the valley containing Sedgemoor is drained by the Ax and the Brue. N. of the Mendips are the Yeo and Avon, with its tributary the Frome. Excepting the slates and red sandstones of the Devonian which prevail W. of the Quantock Hills, and the various members of the Carboniferous group which crop out here and there along the flanks of the Mendip and Polden Hills, the surface rocks and sea cliffs are mainly of Secondary Formation. The Trias of the S. portion is succeeded towards the N. and E. by the Lias and Oolites so characteristic of the country round Bath and Bristol. In the N.E. extensive collieries are in operation, and the quarrying of 'Bath' stone in the N., and of freestone and slate in the S., are important industries. In the valleys of the Yeo and the Brue are extensive meadow below sea-level, and protected by embankments. The soil of the valleys is fertile, and agriculture is in an advanced state. In 1876, of the 839,731 acres in cultivation, 144,294 were under corn-crops, 65,460 under green-crops, and 550,503 were permanent pasture (exclusive of heath or mountain land). There was also about 20,000 acres of forest. In that year the county contained 32,631 horses used for agricultural purposes, 201,472 cattle, 677,765 sheep, and 89,272 pigs. In 1876 there were raised in S. 650,415 tons of coal (from the forty-five collieries), 44,299 tons of iron (value £31,110), and (from the two lead mines) 578 tons of lead ore, producing 301 of lead. Calamine and zinc are also wrought. In 1870 the value of assessed property was £2,204,407. The Romans have left numerous camps and indications of an amphitheatre at Bath. Traits of the original Celtic occupation are noticeable in the population, and the topography is in some respects strongly Celtic; but the district was firmly grasped by the W. Saxons, and became one of their most important settlements. It early embraced Christianity, and the Abbey of Glastonbury (q. v.) and the Cathedral of Wells testify to its ecclesiastical antiquity and renown. Many interesting relics of medieval ecclesiastical sculpture are described in *An Historical and Descriptive Account of the Old Stone Crosses of S.* by Charles Pooley, F.S.A. (Lond. 1877).

Som'erville, Mrs. Mary, born in Roxburghshire, Scotland, December 26, 1780, was the daughter of Vice-Admiral Sir William George Fairfax, who served at Camperdown as Lord Duncan's flag captain. Her love of study and high intellectual capacity were early perceived by her uncle, afterwards her father-in-law, Dr. S. of Jedburgh; but in her literary or scientific studies she received anything but encouragement from her father or her first husband, Mr. Samuel Greig, whom she married in 1804. This latter event, however, brought the beautiful but diffident 'Rose of Jedwood' to London, where she was left very much alone, and found leisure to carry out a systematic study of the mathematical sciences, sketched out for her by Professor Wallace of Edinburgh. In 1807 she returned to her father's house at Burntisland, a widow with two sons. Several years later she married her cousin William S., in whom she found a real intellectual helpmate, and through whom she gained access to the brilliant scientific society of which she soon became a distinguished member. With the chief scientists of the day she formed an intimate friendship—Laplace, Arago, Cuvier, Gay-Lussac, Herschel, Whewell, Babbage, &c. She was the first to whom Wollaston showed the dark lines across the solar spectrum—a discovery which laid the foundation of Spectrum Analysis (q. v.). In 1827 she was induced by Lord Brougham to undertake a popular exposition of Laplace's *Mécanique Céleste*, and the publication of the *Mechanism of the Heavens* in 1831 gained her a reputation which has never faded. Testimonials and honours showered upon her from societies at home and abroad; her bust was set in the hall of the Royal Society, and from Government she received an annual pension of £200, afterwards increased to £300. Her *Connection of the Physical Sciences* (1834) has passed through nine editions, and contains the first conception of the mutual transformability of the various 'forces' of nature—a conception which has now ripened into the theory of Energy (q. v.); her *Physical Geography* (1849) was the first systematic treatment of phenomena which still lack the broad binding principles that science requires; and her *Microscopic and Molecular Science* (1860) attests the singular vigour of intellect which Mrs. S. long enjoyed. After her husband's death in 1860, she retired to Naples, where she died, November 29, 1872. Though she has left behind her nothing of great originality, she easily followed where others led, fully mastering even in her advanced age the modern developments of quaternions and the higher algebra. See *Personal Recollections from Early Life to Old Age of Mary S., with Selections from her Correspondence*, edited by her daughter, Martha S. (Lond. 1873).

Som'erville, William, born at Edstone, Warwickshire, in 1692, from Winchester passed to New College, Oxford, but left the university without a degree, and settled on his ancestral property. Here, open-handed and extravagant, the 'squire poet' involved himself in debt, and 'latterly,' says his friend Shenstone, 'was forced to drink himself into pains of the body to get rid of the pains of the mind.' He died at Edstone, 14th July 1743. Addison he pronounced to be 'with equal genius but superior art' to Shakespeare; but his own poems, mostly on country life, are better than his estimate of others' poetry. They include *The Two Springs, a Fable* (1725), *Occasional Poems* (1727), and the blank-verse *Chase* (1735), his finest work.

Sometsu'ki Ware, a species of Japanese porcelain decorated under the glaze with ornaments in a blue pigment obtained from cobalt ore. It is made principally for domestic use. Another kind, manufactured at Hizen for the foreign market, bears coloured enamels fused on the glaze.

Somme (Lat. *Samara*), a river of France, rises in the department of Aisne, near St. Quentin, flows S.S.W. for 20 miles, then enters the department of S., and after a bend northwards to Peronne, flows N.W. to the English Channel. Length, 116 miles. It is navigable to Amiens, above which place a lateral canal connects its basin with the canal of St. Quentin, and hence with the whole river system of France.

Somme, a department in the N. of France, between Seine-Inférieure and Pas de Calais. Area, 2378 sq. miles; pop. (1877) 556,641. Its soil is argillaceous sand, and its surface an undulating plain interspersed with slight chalk hills. A large tract in the N. has been reclaimed from the sea. Agriculture, the chief occupation, is in a state of high advancement. In 1876 the 225,000 acres under wheat produced 4,248,000 bushels. Cattle, horses, and poultry abound, and much cider is made. There are considerable textile industries and chemical works. The chief town is Amiens (q. v.).

Somnam'bulism (Lat. 'sleep-walking') is the name given to a peculiar condition wherein during profound sleep certain actions are performed. S. may be said to resemble an acted dream. The sleep-walker may rise from his bed, and may in safety proceed along the most perilous places, such as the ledge of a house-roof. In other instances difficult problems have been known to be solved during S. or an allied state, the person awaking in the morning utterly unconscious of having left his couch during the night. Dr. Carpenter says that in S. 'the controlling power of the will over the current of thought is entirely suspended,' and 'all the actions are directly prompted by the ideas which possess the mind.' Ordinary *abstraction* is allied to S., since in a fit of abstraction a person will automatically perform many acts requiring care or skill, the mind dealing with some utterly different matter.

Artificial S. is induced in mesmerism, and the consciousness is for the time entirely absorbed by one set of ideas.

Somnauth Pattan ('the town of the lord of the moon'), a town on the S.W. coast of the peninsula of Kattywar, India, in the petty native state of Soreth, 210 miles S.W. of Ahmedabad, and 163 W. of Surat. It is celebrated as one of the twelve original seats of Siva worship in India, and for the temple

destroyed by Mahmud of Ghuzni in 1025. The town is still strongly fortified, and chiefly inhabited by Mohammedans, who have erected many mosques. The ruins of the great temple indicate its former grandeur, and the spot has recently revived as a place of pilgrimage. The name is known in modern history on account of the proposal of Lord Ellenborough in 1842 to restore the sandalwood gates of Somnauth from the tomb of the conqueror of Ghuzni, 'avenging the insult of 800 years.' Certain gates were actually carried from Afghanistan to Agra, where they now lie, as their progress was stopped by order of the home government. That they are the original gates of Somnauth, however, has been strongly denied.

Sona'ta (Ital. *sonare*, 'to sound'), a free musical composition for one or more instruments, similar to the cantata for the voice. When for three instruments it is called a trio, when for four a quartett, and so on, the S. form being, however, retained. A symphony is a S. for the entire orchestra.

The compositions known as sonatas at the beginning of the 17th c. had only one movement. Lully, Purcell, and Corelli are among the most remarkable of the old S. composers. Through Haydn, Mozart, and Beethoven it has been brought to a perfection which has scarcely been equalled since, even by such fine composers as Dussek, Weber, Onslow, Field, and Schubert. Before the time of Beethoven it usually consisted of three movements—an andante, a minuet, and an allegro. Beethoven introduced the scherzo in the S. which he used sometimes to supersede, and sometimes in addition to the minuet. There is now a broad general plan according to which all sonatas are composed.

A modern S. in four movements consists usually of (1) an allegro, (2) an adagio or andante, (3) a scherzo or minuet, and (4) an allegro forming the finale. In the first movement, which has sometimes an introduction and a coda, there are two leading themes of varied character, one grave and serious, the other spirited and lively. The second part of the first movement forms a kind of free fantasia. The andante, which forms the second movement, should be in broad contrast to the opening allegro. A trio is [illegible]ally appended to the minuet. If the scherzo be used, it [illegible]s a vehicle for quaint fantastic thought and odd outbursts o[illegible]mour. The closing allegro is brilliant and triumphant, and [illegible] usually composed in rondo form. The first and last move[illegible] of the S. have the same tonic which gives its name to the [illegible], as S. in A major, &c.; but the first may be in the majo[illegible]d the last in the minor mode, or *vice versa*. The other m[illegible]ments are generally in different, but in nearly related keys.

Son'chus. Se[illegible] THISTLE.

Sondeli (*Sorex* [illegible]*nus*), a species of shrew-mice (see SOREX), also named the M[illegible]uron, and musk-rat of India. It exudes a strong odour of [illegible] from the inguinal or abdominal glands. Although named [illegible]sk-rat,' it is not a true rat, belonging to the order *Insecti*[illegible] yet it is rat-like in form and size. Its fur is a chestnut hu[illegible]ve and grey beneath.

Son'derbu[illegible] fortified town of Prussia, province of Schleswig-Holstein, [illegible]he W. coast of the island of Alsen. It was in great part [illegible]yed by the Prussian batteries April 5, 1864, and its fine o[illegible]tle is now converted into a Prussian barrack. Pop. (1875) 58[illegible]

Son'dersha[illegible], capital of the principality of Schwarzburg-S., Germany, o[illegible] Bebra-Wipper, 31⅜ miles N.N.W. of Erfurt by rail. It ha[illegible]ne schloss and considerable trade. Pop. (1875) 5723.

Sone or **So**[illegible] a large river of Central India, rising in the native state [illegible]ewah, only a few miles from the sources of the Nerbudda a[illegible] Byturni, and flowing N.E. joins the Ganges about 17 miles [illegible]e Patna city, after a total course of 465 miles. It has b[illegible]entified with the *Eranoboas* of the Greek geographers, an[illegible]e is little doubt that its former junction with the Gange[illegible] at Patna itself, exactly opposite the confluence of the [illegible] For 350 miles it runs through a hilly tract, and for 10[illegible]s through the plains of S. Behar; but it has throughout [illegible]aracter of a mountain-torrent, and is useless for navigati[illegible] Immense quantities, however, of bamboos are floated dow[illegible]he sandy bed is in some places 3 miles wide, and is en[illegible] filled by floods during the rainy season; but in the summ[illegible] stream dwindles to 100 yards wide, and is fordable. It abounds with excellent fish. At Koelwar, where it is joined by its chief tributary, the Koel, it is crossed by the E. Indian Railway, on a lattice girder bridge.

The S. canal system was commenced in 1869, to irrigate the districts S. of the Ganges under the hills from Mirzapore to Monghyr, and also for navigation. The water is taken off by an *anicut* or weir at Dehri, where there is fixed a large engineering establishment. Up to January 1875, £800,000 had been expended in Shahabad district alone, where there are three independent canals. In 1873-74, the year of scarcity, the incomplete channels were used to irrigate 160,000 acres, and gave employment to 40,000 persons

Song (Old. Eng. *sang*, Ger. *gesang*), a little poem intended to be sung or uttered with musical modulations, and usually divided into verses, with a refrain frequently sung in chorus. Almost every country has its national, war, patriotic, love, and convivial songs, which, even if lacking cultivation, are often superior to those of greater poetical and musical pretensions, on account of their native strength and simplicity, and their depth of genuine sentiment and fine natural passion. The *lieder* of German composers take the highest rank among studied compositions of this nature, but Italy, France, and England have in the present century produced many fine S.-writers. A S. in its highest form, when beautiful music and words are united, is a dual product of art to which there are few parallels. In the music the sentiment of the words should be reflected and the gradations of feeling and emotions carefully and faithfully expressed. A hymn is a S. of a religious character. The ballad, a favourite class of S., usually takes a narrative form, relating a short story of action, amour, or adventure, and partaking, as the case may be, of a sentimental, serious, or humorous character. When songs are composed for two voices they are called duets; for three voices trios, and so on; and when for a large number of voices in harmony, Part Songs (q. v.).

Songhay', a region of the Sudan, Africa, on both banks of the Niger, below the great bend of that river in 17° 10' N. lat. For several centuries it was the seat of a powerful Negro empire, which at one time extended from Houssa (q. v.) to Morocco. In 1607 it was conquered by the Moors, who were unable to hold it, and it is at the present time split up into a number of petty sovereignties. The chief towns are Gogo, Darghol, and Kulman.

Sonn'et, The, was invented early in the 13th c. by Peter de Vinea, chancellor to the emperor Friedrich II. It is a poem consisting of fourteen iambic decasyllabic or hendecasyllabic lines. The first eight form two quatrains, the rhymes of the first quatrain always alternating. The leading thought is expressed by these quatrains, and is enlarged in the remainder of the poem, which falls into two terzettes. Here, although there are but six lines, there must be three rhymes, never to be arranged in couplets. Wyatt was the first to write English sonnets according to rigid rules; and its masters in our literature are Surrey, Spenser, Shakespeare, Milton, Wordsworth, and Keats. Drummond of Hawthornden deserves remembrance, though he cannot claim distinction. Shakespeare's sonnets, however, are not strictly in form, but consist of three four-lined stanzas, of alternate rhymes, with a couplet added. See Tomlinson, *The Sonnet; its Origin, Structure, and Place in Poetry* (Lond. 1878).

Son of God is the name applied to Christ as the Second Person of the Godhead. It was applied to Him first as the Messiah (q. v.). According to the Jews, God held intercourse with men by His Memra (Word), by His Sophia (Wisdom), or by His angel or messenger. Later Jewish thought personified this Divine Wisdom, and identified it with the Messiah. In Alexandria speculation on the subject approached nearer to that of Plato (B.C. 400), who taught that the Universe was fashioned by the Logos or active thought of the one Supreme God. This modification of the conception of Deity is the key to all the allegorising conceptions of Philo (q. v.), whose theology is founded on a combination of Jewish-Platonic and Neo-Platonic conceptions. It was, by the Platonic Logos, 'the pattern,' and 'first-born of God,' the 'S. of G.,' &c., that the Supreme Being acted on the world. In the New Testament (John's Gospel), the Logos is identified with Jesus Christ. The idea which the earlier Christian Fathers attached to the term Logos was indefinite. According-

to some it meant the personal existence of Christ before the incarnation; to others it was an abstraction—idea, reason, word, revelation, &c. Accordingly Origen (q. v.) adopted the phrase S. of G. as a more definite expression for the personality of the Logos, whom he held to have been begotten from all eternity. See CHRISTOLOGY.

Sono'ra, a state of the Mexican Confederation, bounded W. by the Gulf of California, and N. by the United States Territory of Arizona. Area, 123,466 sq. miles. Among the spurs of the Sierra Madre on the E. there are many very fertile valleys, and much of the plain country in the W. and N. is also highly productive, though there are numerous stretches of arid sandy soil. The principal products are wheat, maize, sugar, rice, cotton, tobacco, and tropical fruits, two crops annually being produced in some districts. The mineral wealth is said to be considerable, but it has not been developed. Of the population of about 147,000 no less than 100,000 are nomadic Indians. The civilised Indians are said to be the most industrious section of the community, the inhabitants of European descent being indolent and lawless.

Sonthals (*Santáls*), an aboriginal hill tribe found in S. Bengal, India, who have attracted considerable attention. Their physiognomy is distinctly of a negroid type, but their philological and ethnical affinities have not been definitely ascertained. The S. are a nomad race, with little affection for home, but a strong reverence for mountains and rivers. They supply a large portion of the hired labour of the plains, especially in indigo factories. In 1855, owing to the exactions of Hindu landlords and money-lenders, they broke into an armed rebellion, which required to be repressed by vigorous measures. At the same time the tract where they are most numerous was formed into a new district, with exceptional regulations, called the Sonthal Pergunnahs. Area, 5488 sq. miles; pop. (1872) 1,259,287, of whom 850,000 are in British territory. The *district* of the S. covers the Rajmehal hills, and is also peopled by another aboriginal tribe of Pahariya Mals. The chief towns are Sahibgunje and Rajmehal, both on the Ganges, where the river traffic is transferred to and from the railway. The capital is Dumka. In the last few years the S. have shown a tendency to adopt Hinduism in its entirety. A few are Christians. See *Annals of Rural Bengal*, by Dr. W. W. Hunter (1st ed. Lond. 1868); Colonel Dalton's *Descriptive Ethnology of Bengal* (Calcutta 1872).

Soo'soo (*Platanista Gangeticus*), otherwise known as the Gangetic Dolphin, is a species of *Cetacea* (q. v.) belonging to the dolphin family. It differs from other members of its group in inhabiting fresh waters, being found in the Ganges. It attains a length of 10 or 12 feet, has a very prominent and slender muzzle, armed with numerous teeth, has small eyes, and a blow-hole in the form of a vertical slit. The flesh of the S. is described as palatable. It is not eaten in India, but the fat is in repute for its medicinal qualities.

Soot, a carbonaceous powder, condensed from the smoke of coal or wood. S. from pit-coal contains salts of ammonia, and hence possesses manurial value. It is applied sparsely as a top-dressing for grass. Gardeners employ it as an insecticide. Wood-S. was formerly an esteemed vermifuge and antiseptic.

Sophi'a, a town of Bulgaria. See SOFIA.

Sophi'a, St. (Turk. *Aya Sofia*), the name of the famous church built at Constantinople by Constantine on the translation thither of the seat of empire (325-6 A.D.). It was dedicated to the *Hagia Sophia* ('holy wisdom,' *i.e.*, the Logos or second person of the Trinity), and was rebuilt and extended by Constantine in 360. Destroyed by fire in 404, it was rebuilt by Theodosius the Younger in 415, to be again reduced to ashes during the *Nikē* ('Battle') of the Blue and Green factions (532). Forty days later Justinian set about its re-erection with all the ardour of piety. The design was formed by Anthemius, whose genius directed the hands of ten thousand workmen, and within six years the mighty church was consecrated, and Justinian exclaimed during the solemn festival, 'Glory be to God, who hath thought me worthy to accomplish so great a work: I have vanquished thee, O Solomon!' Before twenty years had elapsed, an earthquake overthrew part of the dome, but the damage was repaired, and in the thirty-sixth year of his reign Justinian celebrated the second dedication of the temple, which remains after twelve centuries a stately monument of his fame. St. S. is 269 feet long by 243 broad, and its famous dome, lighted by forty windows, has a diameter of 115 feet, and rises, with a slight curve, to a height from the pavement of 180 feet. The peculiar feature of the church is the placing of the dome, not upon piers and arches on every side, but upon semi-domes E. and W., by which means is obtained a vast space, over 200 feet long by 100 wide, unencumbered by columns. The whole frame of the edifice is constructed of bricks, but the baser material is concealed by a crust of marble, and the interior, comprising the cupola, the two large and six smaller semi-domes, the hundred columns, the pavement, and the walls with their mosaics, presents the appearance of a glowing, harmonious picture. 'The Triumph of Christ was adorned with the last spoils of paganism' (Gibbon). The gold cross which formerly surmounted the dome weighed 75 lbs. The altar and the holy vases and vestments were of purest gold, enriched with priceless gems. According to ancient authorities, the total cost of the structure amounted to 320,000 *pounds* (of silver or gold?), equivalent, at the lowest computation, to one million sterling. As a work of art, St. S. is spoken of disparagingly by Gibbon, but M. Fossati, who was employed by the Sultan to restore part of the building, asserts that he 'knows not any other monument in the world the proportions of which are so vast and majestic.' Fergusson says that it has the finest domical interior of ancient or modern times, both for appropriateness and beauty; adding that for the purposes of Protestant worship it affords an infinitely better model for imitation than anything our own mediæval architects ever produced. (See BYZANTINE ARCHITECTURE.) On the occupation of Constantinople by the Turks (1343), St. S. was converted into a mosque, the Christian emblems being either removed or defaced, and the mosaic pictures hidden under a coating of plaster. Selim II. added four minarets to the building in 1566. Abdul Medjid (1822-61), who in 1847 ordered a complete restoration of St. S., authorised copies of the newly-revealed mosaics to be taken by German artists, and these were subsequently published at the cost of the Prussian Government. The decorations, however, have again been plastered over. See Neale, *Eastern Church* (Lond. 1850, vol. i., p. 237); G. Fossati, *Aya Sofia, as Recently Restored by Order of Abdul Medjid* (Lond. 1852); W. Salzenburg, *Alt-Christliche Bau-denkmale von Konstantinopel, vom 5 bis 12 Jahrh.* (Berl. 1854); Haghes, *Aya Sofia* (Lond. 1856; Fergusson, *Handbook of Architecture* (new ed. 1870); and A. de Amicis, *Constantinople* (Eng. trans. by Tilton, Lond. 1878).

Sophi'a Dorothe'a, Electoral Princess of Hanover, known as the Princess of Ahlden, was born September 15, 1666, the daughter and heiress of Georg Wilhelm Duke of Braunschweig-Lüneberg-Celle. She was married, in spite of her extreme repugnance, in 1682 to her cousin, Georg Ludwig, Electoral Prince Hanover, afterwards George I. of England, and was the mother of King George II. and of Sophia Dorothea, the wife of Friedrich Wilhelm I. of Prussia. The severity of the treatment she experienced from her morose husband drove her to desperation, and she determined to fly with Graf Philipp Christoph von Königsmarck to Wolfenbüttel; but the intrigue having been discovered by the Grafin von Platen, the Graf was slain by the electoral guards as he came from the chamber of the princess, July 1, 1694, and S., after having been divorced, December 28, 1694, was imprisoned in the old castle of Ahlden, where she died, November 13, 1726. See *Die Herzogin von Ahlden* (Leip. 1852).

Soph'ists, The, were a race of philosophers, thinkers, and teachers, who flourished in Greece during the 4th and 5th centuries B.C. While there is no body of systematic doctrine to which they all adhered, yet their tendency was the same. This tendency may be thus briefly indicated. Early Hellenic Philosophy (q. v.) had entirely occupied itself with speculations regarding the origin and nature of the material universe. The theories thus originated were crude and contradictory, as might be expected when we consider that physical science was in its infancy. The inquiring Greek intellect became dissatisfied with such results, and the centre of gravity, so to speak, was changed—man himself became the object of philosophy. But at first man as an individual only was considered. The old, fair, simple, Hellenic life had become a thing of the past. 'What was established and had come down so, had lost its authority; political regulation appeared as arbitrary restriction; moral principle as a result of calculated political

training; faith in the gods as human invention for the intimidation of free effort; piety as a statute of human origin, which every man had a right to alter by the art of persuasion.' To an age believing such things, the S. came preaching that what to each man seemed good was good for him, and that save the individual consciousness there was no standard of right or wrong,—in short, 'man is the measure of all things.' But the S., moreover, were teachers for money of the most various subjects—morals, rhetoric, politics, grammar, etymology, mathematics, the art of war, &c. Many of them travelled from place to place, and made it their boast that they could, without notice, discourse properly on any given subject. This picture is dark enough, but it has its bright side. They were the founders of the proper treatment of many branches of pure and applied philosophy, they brought Attic prose to a high state of perfection, and they widely diffused knowledge, and created a desire for learning which was fruitful of good results. Besides this, many of them, as Prodicus of Ceos, were men of an elevated moral character. The chief S. were Protagoras of Abdera, Gorgias of Leontini, and Hippias of Elis. The later S. were a more degenerate race than their predecessors. Thrasymachus, Euthydemus, and Dionysodorus may be mentioned.

The doctrines of the S. were combated by the life of Socrates and the writings of Plato—it is from the latter, indeed, that we derive our chief knowledge of them. From the lofty standpoint of the Platonic philosophy the S. appear at a great disadvantage, but on the whole Plato, while condemning their doctrines, sees in them the representatives of certain bad principles of human nature, and regards them as men called forth by the circumstances of the time. In accordance with the principles of the Platonic dialogues, the S. who therein appear often take a share in the development of the argument, and much of the truth Plato means to convey is put into their mouths—see, for instance, the *Protagoras*.

It was long the fashion to treat the S. as mere quacks and charlatans. Mr. Grote (*History of Greece*, vii. 474-544) took quite the opposite view, and vindicated their position as philosophers, and their character as men. The generally-received modern opinion, as stated above, lies somewhere between these two extremes. Besides the books referred to above, excellent accounts of the S. are given in the Histories of Philosophy by Zeller, Schwegler, and Ueberweg.

Soph'ocles, born at Colonus, a mile to the N. of Athens, in 495 B.C., was for his beauty and rare accomplishments chosen to lead the choir that sang the triumph of Salamis (480). He gained the first tragic prize at the Great Dionysia with his *Triptolemus* (468), and Æschylus, mortified, withdrew to Sicily; in 441 S. was himself vanquished by Euripides, but a twelvemonth later retrieved the defeat by his *Antigone*. With Pericles he was one of the ten *strategi* in the Samian War (440-439), and in 413, on the destruction of the Syracusan Expedition, he is thought to have been elected one of ten *probuli*, or guardians of the public safety. The story runs that in extreme old age he asserted his mental vigour, impeached by the jealous Iophon, his only legitimate son, by quoting before the *phratores* the matchless chorus, 'Stranger, thou art standing now,' out of the then unfinished *Œdipus Coloneus*. This his latest work was brought out by the younger S., the second of two natural sons, in 401, that is five years after the poet's death (406). Such are the meagre incidents recorded by antiquity of the great Greek dramatist, seven only of whose hundred tragedies have come down to us—the *Antigone* (440), *Electra*, *Trachiniæ*, *Œdipus Tyranus*, *Ajax*, *Philoctetes* (409), and *Œdipus Coloneus*. No one of these bears traces of the Æschylean style ascribed to his earlier plays. Titans in them give place to men, Nemesis to retribution, fantastic imagery to skilfully-woven plot and subtle analysis of the human mind. The same strong piety that quickened Pheidias' hand is strangely blended with pity for mortals' blindness; and passages lauding the one omnipresent Zeus alternate with instances of 'tragic irony.' Thus here we mark the enormous progress of Athenian thought no less than in the transition from Herodotus to Thucydides; while by their harmony and absolute truth to nature these dramas rank in the world's literature second alone to Shakespeare's. And in the mechanical branches of his art S. made a great advance, by raising the number of actors from two to three, by introducing richer 'properties,' and by increasing the strength of the chorus. Of numerous complete editions the best are Dindorf's (3d ed. 2 vols. Oxf. Clar. Press, 1860) and Schneidewin's (Berl. 1873). Jebb has edited the *Electra* (1867) and *Ajax* (1868); Linwood the *Theban Trilogy*, *i.e.* the *Œdipus Tyranus*, *Œdipus Coloneus*, and *Antigone* (1877), as also Campbell in 1872; Blaydes the *Philoctetes* (1870); Pretor the *Trachiniæ* (1877); and Palmer the *Ajax* (1878). See the introduction to Plumptre's scholarly verse translation (2d ed. 1871); Collins' *S.* in *Ancient Classics for English Readers* (1871), and the Lives by Lessing (Berl. 1790) and Schröll (2d ed. Prague, 1870).

Sopra'no, in music, the treble or highest quality of voice only possessed by females or boys. A S. voice of good range extends from to and sometimes considerably higher. It is the most flexible of human voices, is eminently suited for the joyous, bright, and passionate moods of song and for the expression of lofty and inspiring feelings. The next highest class of voice is called mezzo-S.

So'ra, a town of S. Italy, province of Caserta, on the Garigliano, 37 miles N.N.W. of Gaëta, with considerable manufactures of woollens and paper. Pop. (1874) 12,074.

Sor'au, a town of Prussia, province of Brandenburg, 64 miles S.S.E. of Frankfurt-on-the-Oder by rail, with extensive cloth manufactures, bleaching-fields, print and colour works. Pop. (1875) 13,183.

Sorbonne', an establishment founded at Paris in 1253 by Robert de Sorbon, chaplain to St. Louis, for certain secular priests, who should devote themselves to the study of and gratuitous instruction in theology. Directed by its founder, who also compiled the statutes, it bore at first the title of *Collegium seu Congregatio pauperum Magistrorum Studentium*, and comprised two kinds of members—foundationers, with the right of residence and a vote in the management of the college, and hospitallers or mere associates. It dispensed the three degrees of bachelor, licentiate, and doctor, a candidate for the last of which must for ten years have held various disputations, including a final one maintained without food or rest against twenty opponents from six in the morning till seven o'clock at night. The celebrity of its doctors, the crowds of scholars who sought its degrees, gave the S. a European fame, which steadily grew from the 14th to the 17th c.; from a branch of the theological faculty, it became the faculty itself; its voice was paramount in matters of faith. But after the deathblow dealt it by Jansenism (q. v.) its only sign of life was vain anathemas hurled against the philosophers of the 18th c.; and in 1789 it was suppressed with the other ecclesiastical foundations. The buildings, enlarged and beautified in 1629 by Richelieu, who is buried in the S. Chapel, are at present occupied by the Académie Universitaire de Paris, and by the faculties of letters, sciences, and theology. See PARIS, UNIVERSITY OF, and the works there cited.

Sordi'no (Ital.) in music, a mute used in musical instruments to damp or deaden the sound. When the mutes are to be used, the musical direction is *con sordini*, and when not *senza sordini*.

Sor'ex, a genus of *Insectivorous* quadrupeds, including the various species of Shrew-Mice (q. v.). In this genus—the species of which are to be carefully distinguished from ordinary mice—the upper incisors number six, and the lower incisors four. The upper incisors are very long, and are curved and notched at their bases, and the lower incisors project horizontally. There are no canines, and the molars number eight above and six below. The muzzle is very large and acute, and the feet are provided each with five toes. The limbs are not disproportionate, and the tail is of moderate length.

Sor'gho Grass and **Sor'ghum** is a genus of grasses of the tribe *Andropogoneæ*. By some, however, it is considered a subgenus only of *Andropogon*, and by others it has been placed to *Holcus*. *S. vulgare*, including therein several climatological varieties or allied species, ranks as the most important representative. As a wet crop it is more cultivated than any other grain in India (where it is called Cholum or Jowaree), forming in

some parts the principal support of man and beast; it is also equally appreciated in Africa. The very white flour can be made into bread, porridge, and other food-preparations; the panicles are used for carpet brooms; the fibrous-roots for velvet brushes; a kind of beer is made from the seed; and the thick culms with the foliage form an excellent green fodder. It is also a very prolific grass, a single plant having been noticed to produce 12,700 seeds. In the perennial variety (or species) *S. cernuum*, the stem attains a height of 15 feet, with leaves over a yard long. The grain is imported into Europe for feeding cattle, poultry, &c., and is known commercially as Durra, Guinea corn, and Indian Millet (q. v.). *S. saccharatum*, a tall annual species, native of tropical Asia, is a splendid fodder-grass. From the saccharine juice sugar is obtainable; and in the United States treacle is made from it in large quantity. The stem is also used as a culinary vegetable. A variety or closely allied species, *S. Caffrorum*, is extensively cultivated in S. Africa both by natives and colonists, its produce being known as Kaffir corn.

Soroca'ba, a town in the province of São Paulo, southern Brazil. There are rich iron mines in the vicinity. Pop. 12,000.

Sorr'el (Fr. *surelle*, a diminutive of Low Ger. *suur*, 'sour'), a name given to sundry species of *Rumex* (see DOCK) of the section *Acetosa*. Their acid leaves are used for salad and culinary purposes, particularly in French cookery, and are both agreeable and wholesome. Two species are cultivated, namely, *R. scutatus* and *R. acetosa*, but in Britain, as in comparison with most other European countries, they are scarcely grown as a market vegetable. *R. scutatus* (French or Roman S.) is the most esteemed, the leaves being more succulent and less acid. It is a native of France and Italy, and exists as a semi-naturalised plant about the sites of some old gardens in the United Kingdom. *R. acetosa* is a common British plant of open woods and meadows, extending through the N. temperate zone. Of the garden varieties, the large-leaved 'de Belleville' is the best. *Oxyria raniformis*, of mountain rocks and stream sides, called mountain S., is an excellent pot-herb and antiscorbutic. *R. acetosella*, or sheep's S., so plentiful on dry gravelly ground, is worthless. For wood S. see OXALIDACEÆ. S. contains acid oxalate of potassium, tartaric acid, and tannic acid.

Sor'rel Tree of N. America is *Eubotrys arborea* (formerly *Lyonia* and *Andromeda*), a beautiful ericaceous tree of 40–50 feet high, occurring in the valleys of the Alleghany Mountains from Pennsylvania to Florida. The ovoid-cylindrical white flowers are arranged in large terminal panicles, and the oval-oblong leaves are large, smooth, and shining, with a very pleasant acid taste. They 'are frequently made use of by hunters in the mountains to alleviate thirst' (*Michaux*).

Sorren'to (Lat. *Surrentum*), a small town of S. Italy, on a little bay of the same name near the S. extremity of the Golfo di Napoli, 7 miles S.W. of the railway station of Castellamare. It has a cathedral and a few ruins of doubtful antiquity; manufactures silk goods and articles of inlaid wood (*tarsia*), and is a favourite summer resort. S. is the birthplace of Torquato Tasso (q. v.), a marble statue of whom was erected here in 1873. In its immediate neighbourhood to the N.E. is the Piano di S., one of the most fertile parts of Italy. Pop. (1874) 7194.

Sor'tie (Fr. 'a going out'), an attack by the besieged in a beleaguered place upon the investing army.

Sor'tes Bib'licæ. See BIBLIOMANCY.

Sostenu'to, or **Sostenen'do** (It. 'sustaining'), a word in music denoting that the notes to which it is affixed are to be steadily sustained during their full duration.

Soth'ern, Edward Askew, a successful modern comedian, was born in Liverpool, April 1, 1830. His earliest engagement on the stage was at the National Theatre, Boston, U.S., in 1852. For the next six years he played at Wallack's and Keene's theatres, New York. In 1858 he appeared at the latter theatre as 'Lord Dundreary,' in the play of *Our American Cousin*, a perfect piece of caricature which immediately hit the public fancy. It is to this exquisite piece of acting that Mr. S. owes most of his popularity. During the last twenty years he has repeated it many thousands of times in America, at the Haymarket Theatre, London, and in the English provinces. Perhaps his next best character is 'David Garrick' in T. W. Robertson's play of that name.

Sotteville-lès-Rouen, a town in France, department of Seine-Inférieure, on the Seine, with cotton spinning and weaving, and manufactures of soap and chemicals. Pop. (1876) 11,278.

Sou, or **Sol**, a French coin of 5 centimes value, or $\frac{1}{20}$th of a franc, derived from the Roman *solidus*, the name by which the old 'aureus' was known after the time of Alexander Severus, in whose reign coins of one-half and one-third the value of the 'aureus' were introduced. The coin continued to be used by the Franks, but it was suppressed by Pippin, who introduced the *solidus argenteus*, equal in value to $\frac{1}{20}$th of a pound, or libra. The old *soldo* of N. and Central Italy corresponded to the S. of France.

Soubise', the name of an old French noble family, which brought all its titles and possessions into the family of Rohan by the marriage in 1557 of its last heiress with René II., Vicomte de Rohan.—**Benjamin de Rohan, Seigneur de S.**, second son of René II., was born at La Rochelle in 1583, and early distinguished himself in the Huguenot cause. On the fall of La Rochelle he retired to London, where he died, October 9, 1642.—**Charles de Rohan, Prince de S.**, with whom the family died out, was born at Paris, July 16, 1715. He early became a favourite of Louis XV., and accompanied him as aide-de-camp in his campaigns (1744–48). In 1748 he became lieutenant-general, and in 1751, by the influence of Mme. de Pompadour, governor of Flanders. On the outbreak of the Seven Years' War in 1756 he received the command of one of the two French armies, but after some successes he was disastrously defeated by Friedrich of Prussia at Rossbach, November 5, 1757, on which he returned to Paris, the subject of a thousand epigrams. In 1758 he led a new army to Germany, and, with the aid of the Duc de Broglie, achieved successes at Sondershausen (July 23) and Lützelburg (October 10). S. was now made a marshal, and in spite of several reverses kept the command until the peace, February 15, 1763. He now returned to court, where, after the death of Pompadour, he became the favourite of Dubarry. He was the only courtier who followed to the tomb the body of the king, and his devotion induced Louis XVI. to request him to retain his place as minister. S. died at Paris, July 4, 1787. Carlyle, in his *History of Friedrich*, sketches him contemptuously; 'a frivolous insignificant being, now pretty much a blank to everybody.'

Soudan'. See SUDAN.

Soufflé (Fr.), a light delicacy made in various ways. Eggs whipped to a froth are the chief ingredient, and in one variety of S. these are stirred up with a stew of ground rice, milk, sugar, and flavouring agents; the whole is then baked in a mould, and sent quickly to table.

Soul. A belief in the existence of something distinct from the body, called the S., and which survives after the death of the body, has prevailed almost universally in all time. According to Herodotus, the ancient Egyptians were the first to maintain the doctrine that the S. of man is immortal; although it appears from the context that he refers only to the more peculiar doctrine of Transmigration (q. v.), which is held by the Hindus to the present day. Among the Egyptians, man was believed to consist of body, S., and spirit; the S. being of a very refined substance, in the form of the body. Among the Hindus, the S. is of two kinds: the supreme S., and the individual S. of living beings, both of which are eternal. The Buddhistic view of the nature and duration of the S. is a point regarding which we are still in doubt.

The doctrine of the immortality of the S. is now one of the first principles of Christianity, although it is nowhere explicitly stated in the Bible. Some of the early Christian Fathers, especially those of the Alexandrian school, adopted a threefold division of man into body, S., and spirit, which afterwards gave place to the twofold division into body and S. When the Gnostic theory of emanations was developed, the Church maintained that the S. is derived from God. This was held for a time by most to be *per traducem*, *i.e.*, by natural generation from the parents, in the same way as the body. But this theory also gave place to another—Creationism (q. v.), according to which each S. was specially created and united with the body in the womb. Some of the early Greek theologians held that the S. was immortal only by its connection with the Spirit, and the theory found supporters in the Eastern Church in later times. In the West, the Schoolmen taught the immortality of the S. as a theolo-

gical truth, and the doctrine was finally declared to be an article of faith by the Lateran Council (1513).

The principal arguments adduced in proof of the immortality of the S., as opposed to materialism, which regards the S. or mind as simply a function of the brain, are these:—1. The relation of the S. to God as moral governor is held to imply and necessitate an eternal duration of being. 2. The whole analogy of nature is opposed to the idea of the destruction of substance, and therefore, it is argued, the S. must be immortal. 3. The goodness of God seems to require it: (1) because it is improbable that he would annihilate his noblest work, after the greater part of its life has been spent in the acquisition of faculties which cannot be used for want of time; and (2) because it is specially improbable that he would have implanted in us an instinctive desire for eternal life and doomed that desire to complete disappointment. See Bonwick, *Egyptian Belief and Modern Thought* (Lond. 1878); M. Williams, *Hinduism* (Lond. 1877); E. White, *Life in Christ* (2d. ed. Lond. 1876); Hagenbach, *Lehrbuch der Dogmengeschichte* (Eng. trans. Edin. 1847).

Soulié, Mechior-Frédéric, a French novelist and playwright, was born at Foix, 23d December 1800, and educated at Nantes and Poitiers. Shut out from the bar by his political opinions, he turned to literature, and in 1824 published a volume of poems, *Les Amours Françaises*. His five-act tragedy, *Roméo et Juliette* (1828) was a great success; a metrical drama, *Christine à Fontainebleau* (1829), an almost greater failure. Nothing daunted, its author sent fifty 'hands'—he had lately established a saw-mill near the Jardin des Plantes—to applaud the *Christine* of his friend and rival Dumas, and the saw-mill proving a loss, produced in eighteen years 150 novels and hardly fewer plays. Of the latter, *La Closerie des Genêts* (1846) still holds its own; amongst his novels—most of them *feuilletons*, marred by the haste and piled-up incidents of their kind—two are remarkable, *Le Mémoires du Diable* (8 vols. 1837-38) for dramatic, inventive brilliancy, *Le Lion Amoureux* (1839) for psychological insight and studied elaboration. S. died at Paris, September 23, 1847. See Champion, *Frédéric S., sa Vie et ses Ouvrages* (Par. 1847).

Soulouque'. See FAUSTINUS.

Souls, Cure of (Lat. 'care'), according to the Episcopal theory, is vested primarily in the bishop, and every priest to whom it is intrusted acts as his deputy. This trust can properly be given only to priests who have received institution to a benefice—rectors and vicars, to whom, therefore, the term curate strictly belongs. In modern times, however, the term has been extended, and even specially applied to priests and deacons acting as deputies for the incumbents.

Soult, Nicolas Jean de Dieu, Duc de Dalmatie, was born March 29, 1769, at Saint-Amans la Bastide (department of Tarn), where his father was a notary. Entering the Royal Infantry as a private in 1785, in less than ten years (1794) he had risen to the rank of General of Brigade, in 1799 he attained that of General of Division, and in 1804 he was made a Marshal of the Empire. His first achievements were on the E. frontier, and in Switzerland under Massena, but from 1805 to 1807 he served under Napoleon's own eye in Germany, and received the title of Duc de Dalmatie for his exertions in carrying out the provisions of the Treaty of Tilsit. Having been sent to Spain in 1808, S., though defeated at Coruña, compelled the English to evacuate the country, and forthwith overran Portugal, where he made the only mistake of his life in delaying so long at Oporto that the sudden advance of Wellesley and Beresford found him unprepared, and he was forced to retreat to Galicia. Quickly rallying, however, he gained several victories, but finding the British lines inexpugnable, he conceived the bold plan of transferring the scene of war to Andalusia, on the rejection of which, due to the jealousy of Joseph Bonaparte, he demanded and obtained his recall. Scarcely had he joined the Grand Army at Lützen, when the disaster of Vittoria showed how little he could be spared from Spain, and he at once returned with full powers; but though his check of Wellington's advance from October 1813 to April 1814 was one of the finest exploits of modern warfare, it could not avert the inevitable downfall of the Empire. On Napoleon's escape from Elba, S., although he had embraced with ardour the cause of Louis XVIII., could not resist the solicitations of his old general, and fought at Waterloo on the Imperialist side. When peace had again been restored, not even abject submission could save S. from banishment, the sentence of which was passed on him on January 12, 1816. In three years, however, he was recalled from his retirement at Berg, and devoted himself from that time to politics and the improvement of the domestic condition of the country. In 1838 S. was sent to England as Envoy Extraordinary on the occasion of Queen Victoria's coronation, and was received with great cordiality by his old antagonist Wellington, and by the whole nation. In 1847 he retired from public life with the honorary title of Marshal-General, and on November 26, 1851, died at his residence, Soultberg, in his native town. He left two children, Napoleon-Hector, Duc de Dalmatie, and Hortense, Marquise de Mornay. See *S.'s Mémoires* (Part I. published 1854); Napier, *History of the Peninsular War*; Salle, *Vie Politique de S.*; Combro, *Vie, &c.* (Par. 1871).

Sound (Dan., Ger., and Old Eng. *Sund*, derived from the root of *swim*), generally a narrow strait separating an island from the mainland or joining two seas. The name is specially given to the strait (Dan. *Öresund*, 'ear-sound') which connects the Cattegat with the Baltic, and lies between Sweden and the Danish island of Sjælland. The dues which were long levied upon ships passing through the channel were abolished on March 14, 1857, by agreement between Denmark and the interested powers. A pecuniary compensation of £3,937,500, of which Great Britain contributed about a third, was paid to the Danish government, which became bound to maintain the lighthouses and superintend the navigation of the strait. See ELSINORE.

Sound is strictly the sensation which results from the stimulating action of atmospheric or other vibrations upon the aural nerves. Beyond ourselves it has no existence, it is purely subjective, and as a sensation must be carefully distinguished from the vibratory motion which is one of the necessary conditions of its existence. Further, the existence of this vibratory motion is itself conditioned by two things—a disturbing cause, and a suitable medium for transmitting the disturbance to the ear. The study of these in all their possible relations constitutes the science or theory of S. As far as the physics of the subject is concerned it is immaterial what the nature of the medium is, provided it is elastic enough to vibrate; physiology, however, demands that the medium be fluid, otherwise the transmission of the vibrations to the organs of hearing would be impossible. Sounds are usually classified under the two heads of Noises and Musical Sounds. A musical S. is caused by a regular series of exactly similar disturbances or pulses succeeding each other at precisely equal intervals of time; if these conditions are not fulfilled, the S. is a noise. Where law does not rule phenomena no theory can be established; and accordingly we exclude the consideration of all but musical sounds. The nature of these is best studied by considering such a simple case as the note emitted by a tuning-fork. Here, in virtue of the elasticity of the metal, the prongs when displaced from their mean position vibrate about that position according to the simple harmonic law (see HARMONIC MOTION). But the tuning-fork vibrates in the air, a viscous fluid, and as the to-and-fro motion of a board in water gives rise to a series of waves isochronous with the reciprocating motion of the board, in exactly the same way does the fork transfer its vibrations to the particles of air in its immediate vicinity. These similarly affect the next set of particles, and so on. The result, therefore, is true wave motion—the propagation, namely, of a certain *configuration* or grouping among a series of particles. In the case of S., this configuration is a condensation which passes on and is followed by a rarefaction, and the vibrating tuning-fork throws off growing spheres of condensation and rarefaction, just as when a stone is dropped into a pool of water the surface is rippled in concentric circles which spread out from the point where the object has disappeared. See WAVES.

As far as our experience goes, motion in space can only be accomplished through time. We should naturally expect, therefore, that S. requires a definite time to pass from one point in space to another; and all experiments agree in fixing the velocity of S. in dry air at about 332 metres, or 1056 feet per second. This velocity is modified by such causes as the wind, and is affected by the temperature, pressure, and humidity of the air at the time. Assuming Boyle's Law (q. v.), Newton in 1687 calculated from theory the velocity of S., giving for it the expression $\sqrt{\frac{p}{\rho}}$, where p is the pressure and ρ the density of the air at the earth's surface—an expression whose value is 279·95

metres, a sixth smaller than the result given by experiment. This discrepancy was explained by Laplace, who pointed out that there was no account taken of the changes of temperature which occur when air is suddenly compressed and dilated. Thus corrected, theory gives a value differing from the experimental value by less than ½ per cent. S. travels faster in liquids than in gases, and still faster in solids. The experiments at the Lake of Geneva gave 1435 metres per second for the velocity of S. in water at temperature 8° C. According to Wertheim, the velocities in gold, silver, copper, and iron at 20° C. are respectively 1740, 2610, 3560, and 5130 metres per second. The same physicist extended his researches to different kinds of wood, establishing that in all cases the velocity is greatest along the fibre. His values for the velocities along the fibre in pine, beech, birch, and aspen, are respectively 3320, 3340, 4420, and 5080 metres per second.

Passing now to the differences which exist between sounds, we observe that notes may differ in *intensity*, in *pitch*, and in *quality*. Intensity depends upon the amplitude of the vibrations; the longer the vibration path of each particle, the more marked is the difference between the condensation and succeeding rarefaction, the louder the note. Pitch depends upon the number of vibrations in a stated time, or the number of *crests* which impinge upon any stationary object in that time; the shorter the period of each vibration, the greater is the number of vibrations per second, the higher the pitch. Both of these note-characteristics are limited as far as hearing is concerned. A S. may be too weak to be heard; a too intense S. would probably result in the destruction of some part of our organs of hearing. Similarly there are limits of audibility as regards *pitch*—limits which differ for different persons. The vibration numbers of audible notes, however, may be stated as lying between 20 and 38,000. Notes of very high pitch are very painful to the listener, but a note which is excruciating to one may be quite inaudible to another. The third characteristic, *quality* or *character*, corresponding to the French *timbre* and the German *klangfarbe*, 'tone-colour,' depends upon the configuration or internal structure of the individual waves. According to Fourier's theorem (see PERIOD), any periodic function can be expressed in terms of a series of simple harmonic functions, whose periods are 0, 1, ½, ⅓, ¼, ⅕, &c., times the period of the complete function. Now, all musical notes are periodic functions, and, as indicated above, the note given by a tuning-fork is very approximately simple harmonic, and is therefore called a *simple tone*. Not so, however, with the really useful notes in music, such as those given by an organ, a trumpet, a violin, or the human voice. Such notes are *compound tones*, and may be represented as the superposition of a series of simple tones whose periods are related as Fourier's theorem requires. Thus in a violin note of 100 vibrations per second, not only is there the simple harmonic of 100 vibrations which gives the note its pitch, but there are also the simple tones of 200, 300, 400, &c., vibrations, all combining to give a sustained and apparently single sound. These overtones or upper partial tones, as they are frequently called, have no effect upon the pitch, but they decide the quality.

As long as two notes, which are sounded together, are the lower members of the same harmonic scale, they blend together and form what is called a chord. Thus the notes of frequencies 300 and 400, sound agreeably together, being separated from one another by the musical interval known as the *fourth*. When, however, the notes of frequencies 800 and 900 are sounded together, a new phenomenon comes in, which falls next to be considered. Suppose two notes of 100 and 101 vibrations per second respectively to be sounding together. Then the resultant sound-wave will be represented by the superposition of the representative wave-forms of these notes. Once every second the crests are coincident; but between the seconds the one crest is gaining upon the other, until at the end of the second it has gained one whole vibration, and is again coincident. Half-way, therefore, the crest of the one will fill up the trough of the other; and this will have the necessary effect of diminishing the resultant vibration at that instant. Consequently the *intensity* of the sound will then be at a minimum, half a second later at a maximum; and this alternation in intensity will continue as long as the notes are sounded together. To the ear there will seem to be a rise and fall in the intensity occurring every second—in other words, the notes are said to *beat* once in a second. Similarly the notes of frequencies 100 and 102 beat twice in a second; and, in general, the number of beats given by two beating notes is the difference of their vibration numbers. When the notes are very nearly in tune, the beating is slow; and the greater the interval between the notes, the faster the beating, so that if the notes are too distant no distinct beating is heard. The mind, indeed, cannot follow these beats when they occur over 30 times a second; their presence is still evident, however, by the roughness which accompanies the sustained sound. For the ordinary musical scale, notes within a tone of each other have this accompanying roughness, which for semitones becomes very disagreeable, and hence the discordant nature of the chord formed by two successive notes of a diatonic scale. Helmholtz points out that this disagreeable sensation is similar in character to that produced upon the retina by a fluttering light. Beating, however, may take place between notes so far apart that it cannot be due to the cause simply as stated above; and the explanation of this, which is not the least of the services rendered by Helmholtz to our knowledge of the physical basis of music, brings us to the consideration of the *interference* of sounds. It has been implicitly assumed that in dealing with two sets of vibrations we may simply superpose them to get the resultant vibration. Mathematical analysis shows, however, that when two notes of given frequencies are sounded together, additional notes arise whose frequencies are the doubles and the sum and difference of those of the primaries. Hence if we take two notes a fifth apart, say with vibration numbers 400 and 600, the difference tone (200) and the combinational tone (1000) are introduced. The latter cannot always be distinguished, but the former is easily heard as being an octave lower than the lower note of the chord. This low combinational tone was discovered by Tartini (born 1692, died 1770), after whom it is known as *Tartini's beat*. Suppose now that the fifth is slightly out of tune, say 400 and 601 instead of 400 and 600. The first combinational tone has 201 vibrations. In conjunction with the lower primary, this first combinational tone produces a second combinational tone of frequency 199, and these two combinational tones evidently beat, giving two beats per second. This beating of the combinational tones is readily heard upon the harmonium and organ, whose notes are not tuned in perfect intervals but upon the equal temperament system. For the full discussion of these mutual relations of notes, for their connection with the characters of the major and minor chords, and for their bearing upon the development of modern music, the reader is referred to Helmholtz's *Tonempfindungen* (1862, 2d ed. 1870, trans. into English by A. J. Ellis, 1875).

The material systems which by their vibrations affect the atmosphere so as to give rise to these S.-waves, must themselves vibrate in as complex a manner. Indeed, only the simpler cases have as yet been brought within the range of analysis; and the most instructive of these is, perhaps, the stretched uniform cord, such as we have in the piano, harp, violin, &c. If a pulse or wave be sent along such a string, it must be reflected, so to speak, when it comes to the fixed end, and propagated in the reverse direction; and this is what is continually occurring when a stretched cord is vibrating, either as a whole or in two, three, four, or more segments. Two series of equal pulses are propagated along the string in *opposite* directions, and as a necessary consequence certain definite points on the string, mutually equidistant from each other and from the extremities, become stationary, their resultant amplitude being *always* zero. These points, the number of which depends upon the relation which the velocity of the propagated wave has to the length of the string, are called the *nodes*. Including the extremities, the number of nodes is one greater than the number of segments in which the string vibrates. If the string vibrates in two segments, the vibrations are *twice* as fast as those of the same string vibrating as a whole; or, if the fundamental note of the string has 100 vibrations per second, the vibration-number of the note of the doubly-segmented string is 200, that of the trebly-segmented 300, and so on. Thus it is possible to produce from the same string a series of notes harmonically related; not only so, but the string may be made to vibrate in several of these different ways at once, thus giving rise to a *compound* tone. The longer the string the deeper the note, and the greater the number of harmonics which are practically possible. Upon a pianoforte wire these harmonics are easily recognised, and if the dampers are raised, the other wires whose notes correspond to these harmonics are also set in vibration. It is upon this

sympathy between two systems which vibrate in the same times that the phenomena of resonance depend. Every cavity has one or more tones of a certain definite pitch to which it resounds; that is to say, certain tones which, if sounded near or in front of it, will be reinforced in intensity. It is to effect this reinforcement that tuning-forks are mounted upon resonance boxes. Any particular vowel-S. also owes its distinctive quality to the resonance of the mouth-cavity which is necessary for its production. The S. in passing through the mouth has such of its harmonics reinforced which correspond or approximate in pitch to the proper tones of the cavity. Such is the theory of Helmholtz, established upon experiments of Willis and Donders, supplemented by his own—a theory which has been corroborated and extended by the recent researches of Professors Jenkin and Ewing into the nature of vowel sounds by analysis of the impressions upon the tin-foil of a phonograph, which were magnified and transferred to paper by an ingenious mechanical device. See *Transactions of the Royal Society of Edinburgh* for 1877-78; also *Nature*, vol. xviii. pp. 340, 394 (1878).

The vibration of bars, plates, and membranes offers increasing difficulties to the mathematician, but experimentally many interesting facts have been established which serve as landmarks to the analyst. Chladni's figures, produced by bowing a metal plate, two points of which are fixed, and over which minute particles of sand or other powder have been sprinkled, are familiar to many. The plate is set vibrating in segments, and along the nodal lines the particles settle, being tossed from the intermediate portions by the force of the vibrations. The theory of the vibration of membranes has acquired a greater interest since the invention of the phonograph. Sedley Taylor has taken advantage of the laws of interference of light in his phoneidoscope, in which the nodal lines of a vibrating soap-film are shown by the contours of coloured bands, which are viewed by reflected light.

The reflection and refraction of S. in air have many important practical bearings, some of which are considered under ACOUSTICS and ECHO. In a homogeneous atmosphere S. travels in straight lines; but in certain circumstances heterogeneity of the air may occasion considerable deviation of a sonorous ray from its rectilinear course. According to Professor Osborne Reynolds, the diminution of temperature of the air as we ascend must produce upon the S.-rays an effect analogous to the optical phenomenon of the mirage. In other words, the rays are bent upwards, so that the S. may be quite inaudible at a place not very distant from the source of S. On a bright sunny day the vertical variation of temperature is much more rapid than upon a dull or rainy day —consequently the bending of the once horizontal ray is greater, and audibility at a distance diminished. This is the explanation which Reynolds offers of the interesting experiments of Tyndall upon fog-signals, which were worst heard upon clear warm days. See *Philosophical Transactions* for 1874. It is probably the true theory, though Tyndall's own explanation that the sounds were stopped, reflected, and broken up by the flocculent condition of the atmosphere arising from unequal heating or moisture, may also hold in certain cases, and undoubtedly gives a reason for the continued and diminishing echo which followed the blast of a siren, 'when the sea was of glassy smoothness,' and the air apparently clear. The first really scientific treatises upon the subject were the works of Chladni (q. v.), who collected all that was known up to his time, and added much that was new. Savart, Mersenne, Laplace, Lissajoux, Duhamel, Trevelyan, Seebeck, Cagniard de la Tour, and others, made important additions both to the theory and methods of experiment (see SIREN, TREVELYAN, EXPERIMENT, &c.); but not till the appearance of Herschel's article in the *Encyclopædia Metropolitana* was there any systematic treatment of the subject. Airy's small treatise (1869) is a valuable compendium of the mathematics of vibrations. Helmholtz's *Tonempfindungen*, already mentioned, threw a flood of light upon many doubtful points, combining with rare skill the scattered work of his predecessors, and establishing harmony upon a real scientific basis. Sedley Taylor's *S. and Music* (1871) is a popular exposition of many of these discoveries. Mayer's *S.* (1878) is an elementary introduction to the science. The standard treatise upon the subject is Lord Rayleigh's *Theory of S.* (3 vols. 1877-79), which besides developing the theory systematically by the aid of the most powerful methods of modern analysis, contains descriptions and gives the results of the scattered experiments of many generations.

Sound'ing, the operation by which the depth of water in sea, lake, or river is ascertained. Every sea-going vessel is provided with such an apparatus, which consists usually of a 'line and lead.' The lead is lowered till it reaches the bottom, a circumstance indicated by the slackening of the line, the length of which run out gives the approximate depth. As a general rule, soundings are taken only when a vessel is near a coast or reef; and for such shallow depths the ordinary apparatus is sufficient, and such possible sources of error as may arise from currents or from the motion of the ship itself are of little consequence. When, however, soundings are being taken around a coast with a view to the construction of a chart, greater precautions must be taken. Within recent years, the thirst after accurate knowledge regarding the configuration and constitution of the bed of the ocean has resulted in the development of what is significantly called 'deep-sea S.' The great depths to which the line must be run out necessitates the use of a heavier lead, otherwise the motion would get so slow as the bottom was approached that there would be great difficulty noting the exact time at which the bottom was really reached. There is also a limit to the weight which can be used, if it is purposed to pull it up again—a limit fixed by the strength of the rope. Now, however, in all deep-sea soundings the apparatus is so constructed that the weight is disengaged at the moment it reaches the bottom, and only that part drawn up which is intended to bring up a sample of the gravel, sand, mud, or ooze which covers the bottom. The first contrivance of this nature was invented by J. M. Brooke, a midshipman in the United States Navy, about the year 1852, and was successfully employed by the brig *Dolphin* in measuring depths and bringing up specimens from a depth exceeding 200 fathoms. The bull-dog apparatus invented by Steil, the assistant-engineer on board H.M.S. *Bull-Dog* during her famous S. expedition in 1860, was so constructed that when the weight was disengaged two scoops or jaws closed and retained in their grasp a considerable quantity of the substance at the bottom. The apparatus used successfully on board the *Porcupine* in the summers of 1868-69-70 was a modification of Brooke's, and was specially constructed with a view to the more thorough investigation of the nature of the sea-bottom. For a description of it see *The Depths of the Sea*, by Sir C. Wyville Thomson (1873). One great source of error in registering depths by S. is the uncertainty as to the line being quite straight and vertical. Not only do the various undercurrents make bights and bends upon the line, but the motion of the ship must have a serious effect, especially when it is remembered that except in very special cases soundings are taken when the vessel is under some way. Various attempts have been made to devise an instrument which will register only *vertical* descent. The most successful of these hitherto has been 'Massey's Fly,' which is attached above the lead. A modified screw of four brass vanes is set in rotation by the relative up-rush of water as the weight descends, making so many revolutions for a definite descent—revolutions which are registered upon a dial. At great depths, however, its action is somewhat unsatisfactory. Of late years Sir W. Thomson has suggested the use of pianoforte wire instead of rope, and has justified this suggestion by extensive experiments. He has also invented a self-registering S. apparatus, which gives the depth reached by the compression of air in a tube under action of the increased pressure of the water at the depth attained. Siemens' bathometer is a very delicate instrument for indicating slight variations in the force of gravitation, and thus indirectly gives a fairly accurate estimate of the *average* depth of the sea under the spot where the bathometer is.

Sounding-Board, in a pianoforte, a piece of wood, usually the best Swiss fir, placed behind the strings in order that the resonance may be increased. Its edges are attached to the framing, leaving the central part to vibrate freely under the strings when they are struck. The term is also applied to a wood screen placed behind a speaker in halls and churches for acoustic purposes.

Soup is a culinary preparation of the highest value, and in one or other of its endless forms is in almost universal use. The basis of nearly all soups is the juices and soluble portions of animal food obtained by boiling the meat in water, but there are kinds of S. in use in which vegetable matter alone enters. As in the making of S. all edible varieties of animal food—beef, mutton, pork, venison, game, fowls, turtle and terrapin, fish

and molluscs—enter, and as these are variously treated with all known kinds of spices, culinary herbs, vegetables, cereal grains, flours and feculas, it is obvious that the kinds of S. exceed enumeration, and are as variable as the ingenuity and tastes of the cooking and eating public. What is termed *stock* is used for the preparation of all kinds of meat S., the stock being prepared by boiling down in a stock-pot all fragments and remains of meat, fowl, and ham, and in this way much meat not ordinarily presentable at the table is utilised. Soups may be classified under these heads—clear meat S., gravy S., turtle S., game S., poultry S., vegetable S., and broth and fish S. As an example of a most economical, palatable, and nutritious diet the following recipe for pea S. may be quoted: Split pease and meat, 1 lb. of each; pot barley, 1 oz.; salt, 1½ oz.; onions, 1½ oz.; black pepper, $\frac{1}{16}$ oz.; and water, 4 quarts. The pease should be steeped in cold water for twelve hours before boiling. The meat is to be boiled in five pints of water for three hours, and in the resulting stock the pease are to be boiled one hour, after which the S. is passed through a strainer. The salt, pepper, onions, and barley are then added, and boiled for an hour, the water being made up to the four quarts. The addition of fresh vegetables to S. is to be recommended both on the score of health and economy, and the following ingredients go to form a soup used by the Parisian *Administration de l'Assistance Publique*, under the advice of eminent physiologists and physicians. Water, 4 pints; meat with bone, 2 lbs.; carrots, turnips, and other vegetables, 6 oz.; salt, ⅗ oz.; roast onion, ¼ oz. To make S. and broth prepared with meat nutritious, it is necessary to boil slowly, but in such a case the boiled meat becomes perfectly useless for eating. Slow boiling further prevents injurious coagulation of the finely divided albumen and fibrin contained in the S., and it also retards the solution of the gelatinous matter in the meat, a substance of doubtful nutritive value.

South, Robert, a London merchant's son, was born at Hackney in 1633, and educated at Westminster under Dr. Busby. He gained a Christ Church studentship (1651), is said to have been ordained by a deprived bishop (1658), and was appointed Public Orator of Oxford (1660) in reward for a sermon before the king's commissioners against the 'quacks and mountebanks of the late troublous times.' As such he delivered orations at Clarendon's installation in the chancellorship, the double obsequies of Laud and Juxon, the foundation and opening of the Sheldonian Theatre, the conferring of degrees on the Dukes of Monmouth and York and the Princes of Orange and Tuscany. Clarendon made him his domestic chaplain; by 1670 he was a canon of both Westminster and Christ Church; and in 1677 he attended as chaplain Laurence Hyde, the future Earl of Rochester, on his embassy to the Polish court. A curious narrative of his travels, in a letter to Pococke, is given on p. 20 of his *Posthumous Works*. On his return he became rector of Islip and chaplain-in-ordinary to the king, and a sermon where Cromwell figures as a 'bankrupt, beggarly fellow,' is said to have drawn from Charles the offer of a bishopric, which S. declined. Unluckily this sermon is dated a fortnight later than Charles's death, so whether S. had really occasion *nolle episcopari* is hard to say. He loved a Papist scarce better than a Puritan, though passive obedience stayed him from onslaughts on James's measures; but William, whose rule S. simply 'acquiesced in,' found him a warm opponent to comprehensive and toleration schemes. The renegade Sherlock he crushed with Swift-like wit and fury in their great battle on the Trinity (1695); high-church Sacheverell he ardently supported; and he had lately voted for a brother of the attainted Duke of Ormond, when he died, 8th July 1716, and was buried in Westminster Abbey. The 'last great divine of the 16th c.,' as others called him, the 'preacher of the old Cavaliers,' as he called himself, S. was a vehement churchman, a painful scholar, a master of racy yet stately prose. A thinker and theologian of pre-Baconian type, he sneers at the New Philosophy and Royal Society, mentions Descartes but once, and speaks of Milton as 'that blind adder who has spit poison on the King's person and cause.' His *Opera Posthuma Latina* and *Posthumous Works* appeared in 1717, the latter with a Memoir prefixed; his *Sermons Preached upon Several Occasions* have been printed at the Clarendon Press (4 vols. 1842).

Southamp'ton, a seaport, town, and county of itself in Hampshire, England, 78¾ miles W.S.W. from London by rail, stands on a peninsula at the head of S. Water, between the Itchen on the E. and Test or Anton on the W. There are still standing considerable remains of the ancient walls and three of the gates, of which the Bar Gate, with its huge effigies of Bevis and Ascupart, is the most important; but the two-towered building near the East Gate's site, long used as a prison, was partly restored in 1876. On 12th August 1878 the Prince of Wales laid the dedication-stone of St. Mary's, now building as a memorial to Bishop Wilberforce. The new church, as designed by Mr. Street in Early English style, will be 168 feet long by 80 feet wide, with a noble spire 204 feet high; and its total cost is estimated at £18,000. Among the fifteen other churches are the ancient St. Michael's, Holy Rood, and St. Laurence; All Saints', a Grecian structure (restored 1872), St. Luke's (1853-73), St. Matthew's (1869-74), St. Denys', Portswood, designed by the late Sir G. G. Scott (1868), and the French Protestant St. Julien's or God's House. S. has besides twenty-one chapels, and its public buildings include the Hartley Institute (1862-72), with a school of science, museum, and art gallery, the Watts Memorial Hall (1876), the Philharmonic Rooms (1865); the Royal S. Hants Infirmary (1838-68), the headquarters of the Ordnance Survey (1857), and King Edward VI. Grammar-School (1553, rebuilt 1873), which in November 1878 had 9 masters and 70 boys. The Common Fields (60 acres), laid out as an arboretum, contain monuments to Richard Andrews and Isaac Watts, and a Prince-Consort Memorial was erected near the East Gate above-mentioned (1877). New public offices and a sea-wall are about to be erected, and 6 miles of tramway will be completed by the end of 1878. The docks, opened in 1842, cover 28 acres, and include four graving-docks. The income of the dockyard in 1877 was £112,222. In 1877 there entered 4808 vessels of 1,088,579 tons, and cleared 4867 of 855,102 tons. The exports amounted to £8,665,078, the imports to £9,055,179, the customs to £53,597; and on December 31 of that year 306 vessels of 68,369 tons were registered as belonging to S., besides 176 fishing-boats. Shipbuilding is the leading industry, 16 British vessels of 10,520 tons being turned off the stocks in 1877. S. publishes two weekly and two bi-weekly newspapers, and returns two members to Parliament. Pop. (1801) 7913, (1871) 53,741. Founded by Saxons near the site of the Roman *Clausentum*, S. suffered much from the Danes, was a favourite residence of Cnut, and was the port whence Edward III. set sail (1346) and Henry V. (1415). An attack by the French (1377), the landing of Philip of Spain (1554), and the ravages of the Plague (1665), make up the chief points of the history of S. down to the sudden growth in the present century, due to its selection as the mail-packet station for the E. and W. Indies, the Brazils, the Cape, &c. See Sir H. Englefield's *Walk through S.* (South. 1805).

S. Water, an inlet 11 miles long by 2 miles broad, runs inland from the Solent in a north-westerly direction, and, almost entirely landlocked, is one of the safest harbours on our coasts.

South Austra'lia. The British colony thus misleadingly named occupies the central portion of the Australian continent, stretching across its entire breadth, and separating W. Australia from Queensland, New S. Wales, and Victoria. The original colony of S. A. comprised the tract lying to the S. of the parallel of 26° S. lat., and between the meridians of 132° and 141° E. long., an area of 300,000 sq. miles. In 1861 the western boundary was changed to the meridian of 129° E. long., and a region known as 'No Man's Land,' with an area of 83,328 sq. miles, was added to the colony. In 1862 the portion of the continent to the N. of the parallel 26° S. lat., and between the meridians 129° and 138° E. long., was also added to S. A. This last region is known as the Northern Territory, and has an area (exclusive of the islands on its coast) of 531,402 sq. miles, making the total area of the colony 914,730 sq. miles, or 7½ times that of the United Kingdom.

The southern coast of S. A. is penetrated by two long arms of the sea, named respectively Spencer and St. Vincent Gulfs, and the northern coast is broken by bays and lined by islands. Nevertheless good harbours are scarce; the best being those of Port Darwin in the Northern Territory, and Port Adelaide on St. Vincent Gulf, the latter being largely artificial. By far the greater part of the surface of the country consists of level open plains, which in some parts are fertile, in others fairly grassed, and in others again are dreary wastes of sand and stones.

The mountains are few and unimportant, the principal chain, being the Flinder's Range, stretching N.N.E. from the head of St. Vincent Gulf, and attaining in three or four of its summits a height of 3000 feet. Mount Lofty, near Adelaide, is 2334 feet high. Detached ranges of low elevation are found in various parts, and succeed one another half-way across the continent, near the heart of which are Mounts Conway and Charles, estimated to be 4000 feet in height. This central region is found to be much less hopelessly desert than it was at one time believed to be, and many extensive districts within it will support cattle and sheep. Much of this region, however, still remains to be explored. The interior of the Northern Territory is a table-land, with an average height of 300 to 900 feet, between which and the coast there intervenes a low, level tract of alluvial soil, from 30 to 100 miles wide, much of which is overflowed in the rainy season. The only river of any size in S. A. proper is the Murray (see AUSTRALIA), whose lower course lies within the colony; but in the Northern Territory, which enjoys a tropical rainfall, there are several large streams, navigable for seagoing vessels for distances varying from 40 to 100 miles. The chief of these rivers are the Roper, Liverpool, S. Alligator, Adelaide, and Victoria. S. A. possesses a number of large shallow lakes, most of which are salt or brackish, the chief being Lakes Gairdner, Torrens, Eyre, Frame, and Amadeus. Most of these vary much in size according to the dryness of the season, Lakes Eyre and Torrens in particular varying from seas to mere lagoons. From the nature of the drainage, the existence of other large lakes in the unexplored interior is suspected.

The climate of a country stretching, as S. A. does, over 27° of latitude, is necessarily varied. That of the Northern Territory, except on its southern border, is of the ordinary tropical character, with a wet and a dry season, while that of the central region, S. of the tropic, is extremely dry and hot. In the southern districts of the colony the heat for four months is excessive, and scorching winds blowing from the interior frequently raise the temperature to 105° or 110° in the shade. During the remaining eight months the weather, though warm, is very enjoyable, and there is no winter to speak of. Owing to the dryness of the climate the heat is not deleterious to Europeans, who work in it without injury, and the colony is remarkably free from deadly fevers. At Adelaide the mean annual rainfall is 21 inches, and the mean annual temperature 63°.

The fauna and flora of S. A. are much the same as those of Australia generally (see AUSTRALIA). Where rain is sufficiently abundant, the soil is fertile, and produces wheat of the finest quality. In 1878 there were 1,163,646 acres under this crop, and the average yield was nearly 8 bushels per acre. The vine is also largely cultivated, and many excellent wines are made. A commencement has also been made with the drying of raisins and currants, and the cultivation of the almond and olive. The pastoral equals the agricultural interest in importance, and in 1875 there were in the colony 6,120,211 sheep, 185,342 cattle, and 93,122 horses. The breeding of buffaloes has lately been begun on a large scale in the Northern Territory.

The mineral wealth of S. A. is very great. By far the most important item in it is copper, the first discovery of which was made at Kapunda in 1843, and was followed by the discoveries of the far richer deposits at Burra Burra in 1845, Wallaroo in 1860, and Moonta in 1861. The Moonta mines alone have paid over £1,000,000 in dividends, while not a penny of capital was subscribed to work them. Copper is known to exist over a wide area of country at the head of St. Vincent Gulf, and iron is also plentiful in many places, but is not yet wrought. Gold is obtained in the Northern Territory, where deposits of copper, lead, and iron are also known to exist. No coal is found in S. A., but it is brought from New South Wales.

In 1877 the total value of the import trade of S. A. was £4,177,927, and that of the export trade £3,608,667. According to the statistics for 1875, the relative percentages of the staple exports to the total was as follows:—Wool, 42 per cent.; breadstuffs, 36 per cent.; copper, 18 per cent.; miscellaneous, 4 per cent. In 1876 there were 328 miles of railway open, and 512 miles under construction. A line of telegraph stretching across the continent was completed in 1872, and connects the colony by submarine cable with the telegraphic systems of the world generally. In 1875 there were 268 schools, with 16,765 pupils. The pop. of S. A. in 1877 was officially estimated at 230,900, exclusive of the aborigines, whose estimated number in the settled districts was (1871) 3369. The debt of the colony in 1877 was £4,784,000, or £20, 14s. 4½d. per head.

The first settlement in S. A. was made at Glenelg, on 28th December 1836, under the auspices of the South Australian Colonisation Association, acting under powers obtained from the Imperial Government. In 1851 the colony received its first Constitution, which was considerably modified in 1856. At the present time the government is administered by a Governor appointed by the crown, and assisted by an Executive Council responsible to Parliament. The latter is composed of a Legislative Council and a Legislative Assembly, with 18 and 46 members respectively. The government of the Northern Territory is administered by a Resident, stationed at Palmerston, and instructed by telegraph from Adelaide. The chief towns in the colony are:—Adelaide (q. v.), the capital; Port Adelaide, Kapunda, Gawler, Glenelg, Wallaroo, and Moonta; and in the Northern Territory, Palmerston and Southport. See Harcus' *S. A.* (Lond. 1876); *The Australian Handbook for* 1878 (Lond. 1878), and Blue-Books.

South Bend, a town of the State of Indiana, U.S., near the St. Joseph River, 85 miles E. of Chicago by rail. It has 12 churches, 4 newspapers, and several higher educational institutions, besides the government schools. Its manufactures are principally of hardware, carriages, and waggons. Pop. (1870) 7206.

South'cott, Joanna, a religious visionary, was born in Devonshire, 1750. Without any education, she was employed as a domestic servant at Exeter, where she joined the Methodist Church in 1790, and became acquainted with a man named Sanderson, who claimed prophetic powers. In 1792 she announced herself as a prophetess, and began to write and dictate prophecies in prose and rhymed doggerel. Soon afterwards she declared herself to be the woman spoken of in Rev. xii., and issued sealed papers to her followers which she promised would assure the salvation of the purchasers. She attracted many followers, and came to London on the invitation of Sharp the engraver, where in 1803 were published *A Warning to the whole World from the sealed Prophecies of J. S., and other Communications given since the Writings were opened on the 12th of January* 1803; in 1804, *Copies and Parts of Copies of Letters and Communications written from J. S. and transmitted by Miss Townley to Mr. W. Sharp in London*; in 1813-14, *The Book of Wonders in Five Parts*; in 1814, *Prophecies concerning the Birth of the Prince of Peace, extracted from the Works of J. S.* She announced that she would be delivered of the Prince of Peace at midnight on the 19th October 1814, and a disease under which she suffered favouring the delusion, many persons anxiously awaited the event, and large sums were contributed beforehand. However, she fell merely into a trance, and died December 27 of the same year, with the declaration that, 'if she was deceived, she was at all events misled by some spirit, either good or evil.' Dr. Reece, her medical attendant, published *A Correct Statement of the 'Circumstances that attended the Last Illness and Death of Mrs. S.* (Lond. 1815). In 1851 there were in England four congregations of her followers, comprising 198 persons, and a community was founded at Wenthorp in 1857.

South'ern Alps, the name given to the central and loftiest portion of the great dividing range of the S. Island of New Zealand. Many of the peaks are perpetually snow-capped, the highest being Mount Cook (13,200 feet). The glaciers of the S. A. rival those of the Swiss Alps in magnitude, and on the W. side extend to within a few hundred feet of the sea-level.

South'ey, Robert, born at Bristol, 12th August 1774, after four years' experience of a public school, was expelled from Westminster for satirising corporal punishment (1792), but a twelvemonth later went up to Balliol. At Oxford he met with Coleridge; and the two, both visionaries, both red republicans, began by planning a New World, 'pantisocracy,' and ended by their marrying two Miss Frickers (1795). In a six months' visit to his uncle, a Lisbon chaplain, S. learnt Spanish and Portuguese, and returning found that his *Joan of Arc*—saved from an *auto-da-fé* of 15,000 boyish verses by a publisher's offer of £50—was making its way to fame. He first tried medicine, 'the study of all others most unfavourable to the moral sense;' then law, 'detestable!' and finally, after shifting from Westbury to Wales, and from London to Ireland, settled at Keswick (1804), his

home for forty years. *Thalaba* had appeared in 1803, and from Greta Hall came *Madoc* (1805), *The Curse of Kehama* (1810), and *Don Roderick* (1815), in prose the Lives of Nelson (1813), Wesley (1820), Bunyan (1830), and Cowper (1837), the histories of Brazil (3 vols. 1810-19) and the Peninsular War (3 vols. 1822-32), the *Book of the Church* (1824), and *Doctor* (5 vols. 1834-37). Some fifty volumes more and fivescore *Quarterly* articles make up the tale; but his charities almost outran the income derived from writing, from a pension of £100 (1807—£300 since 1835), and from the poet-laureateship (1813). A High-Church Tory now, he passed a studious, domestic life, varied by rare excursions to the Continent, cheered by the friendship of his neighbour Wordsworth, darkened by his first wife's insanity, and latterly by the failure of his own strong mind. He died at Keswick, 21st March 1843. Strangely has time reversed his own and his compeers' verdicts. Those epics, 'the best that have left the press since *Paradise Lost*,' which Scott read four times through, are tedious monuments of misplaced learning to the generation that with Forster pronounces his self-scorned ballads to be 'masterpieces of fantastic beauty.' To Brazil, possibly, S. is 'as Herodotus to Europe;' with us his fame as a master of simple, graceful prose rests on the Lives of Nelson and Wesley, which but for publishers' law he had made ten times as long. His bulkier works sleep well, along with the fittingly voluminous *Life and Correspondence of Robert S.*, by his son (6 vols. Lond. 1850).

South Mol'ton, a market-town of Devonshire, England, on the Mole, 26 miles N.N.W. of Exeter, has a Perpendicular parish church (restored 1865), a spacious market-house in Italian style (1864), a guild-hall, literary institute, &c. Pop. (1871) 3978.

South Norwalk, a seaport of Connecticut, U.S., on Long Island Sound, 42 miles by rail N.E. of New York, has 4 churches, 1 newspaper, and varied hardware manufactures. Pop. 5000.

South Polar Research. Exploration in the strictly S. Polar region is of comparatively recent date. After the discovery of America, many expeditions, first Spanish and then Dutch, set out in search of a southern continent, which was generally regarded as the necessary counterpart of the northern lands. The search for this *Terra Australis incognita* led to the discovery of New Holland (Australia, q. v.), and many of the Oceanic islands. At the close of the 16th c. a Mappemonde by Judocius Hondius, in a Dutch account of Drake's *Voyage Round the World* (reprinted by Hakluyt Society, 1854), illustrates the prevailing belief in an immense *Terra Australis*, extending from the S. pole into the Atlantic beyond the Antarctic circle, and as far as the tropic of Capricorn in the Pacific, embracing in its area Australia, and separated only by Torres Strait from New Guinea. Subsequently for some two centuries little was actually added to European knowledge of the region, and no attempt was made to penetrate towards the Antarctic circle. The first navigator known to have passed within the circle is Captain Cook (q. v.). During his voyages in 1772-74 and 1775 he entered the circle in three different quarters, but after reaching 71° 10′ on the 107th meridian, his progress was arrested by firm fields of ice. Though he saw no land S. of Sandwich Land or Southern Thule, in 59° and 60° lat., or only a short way beyond the parallel of Cape Horn, he inclined to the belief that there was 'a large tract of land near the pole.' The Russian Bellinghausen discovered Petra and Alexandra Islands in 1821, and two years later Weddell advanced three degrees beyond the points reached by Cook. Enderly and Kemp Islands, both crossing the circle between 45° and 60° E. long., were discovered by Biscoe in 1831-33, and Sabina Land, further E. but in the same latitude, by Balleny in 1839. In 1840, D'Urville coasted Adelie and Clarie Lands, and Captain Wilkes, of the United States Navy, extended these discoveries on the same parallel, and thus proved that there was a chain of islands, just without the Antarctic circle, usually connected by an ice-barrier, extending from the 95th to 150th meridian. During the years 1839-43, Captain (afterwards Sir James) Clark Ross (q. v.), accompanied by Captain Crozier, made the important discovery of Victoria Land (q. v.), on the meridian of New Zealand, and in tracing its coast carried the *Erebus* and *Terror* to the highest southern lat. ever attained—78° 10′. Greatly retarded by a strong northerly current, the expedition passed along the E. side of Victoria to Cape Crozier, whence the coast takes a sudden easterly bend, continuing in that direction as far as it was traced, or for 33° E. long. The coast of Victoria is flanked by a lofty chain of mountains, the Admiralty Range, comprising Mount Sabine (10,000 feet high), Mount Herschel (12,000 feet), Mount Erebus (an active volcano, 12,362 feet), and Mount Terror (10,884 feet). The Parry Mountains, another lofty chain, run S. and inland from the vicinity of Franklin Island, which is 12 miles long and wholly composed of igneous rocks. The whole coast is bound by an ice-belt presenting to the sea a vertical face from 200 to 300 feet high, beyond which the surface presents the appearance of a vast plain of frosted silver. Ross, while regarding the islands discovered by D'Urville as of inconsiderable size, expressed the belief that the enormous mass of ice which bound the discoverer's view was a range of mountain-land covered by snow. The expedition led by Ross is one of the most remarkable and successful on record; it not only determined the position of the magnetic pole in 75° 5′ S. lat., and 154° 8′ E. long., but amid manifold perils ascertained the course of currents, the temperature and pressure of the atmosphere, the geological character of the new lands, and the extent of the distribution of plants and animals. In 1845 the *Pagoda*, commanded by Captain Moore, advanced by order of the Admiralty into the Antarctic seas for the purpose of extending Ross's magnetic observations. In 39° 30′ E. long., 68° S. lat., the vessel was stopped by pack-ice, but after changing her course she got beyond lat. 73°. Little resulted from the voyage, and the task of exploration was abandoned. Captain George Nares, with the experience gained in the N. Polar Expedition of 1876, took the command (1878) of the *Alert* and *Discovery*, bound for the southern seas. For a comparison of Arctic and Antarctic phenomena, see POLAR EXPEDITIONS. See also *Early Voyages to Terra Australis*, by B. H. Major (Hakluyt Soc. 1859); Cook's *Second Voyage Round the World* (1779); D'Urville, *Voyage au Pôle Sud* (1840); Ross, *Southern Seas* (1847); and Stoddard, *South-Sea Cruises* (1874).

South'port, a watering-place of Lancashire, incorporated in 1867, stands on the southern shore of the Ribble estuary, 17½ miles N. of Liverpool by rail. A fine promenade extends for 960 yards along the spacious sands, and from this projects a pier (1859-64) 24 feet wide by 1465 yards long, and traversed by a tramway. Including St. Luke's, now (1878) in course of erection, S. has six churches, and several of its chapels are fine edifices. Other buildings are a Grecian townhall (1853), the Cambridge Hall (1873) with an assembly room 120 by 50 feet, the Atkinson Free Public Library and Art Gallery (1878), a 'Glaciarium,' or skating-rink of real ice in Queen Anne style (1878), the Victoria Baths, erected at a cost of over £30,000. A handsome new market is (1878) being built, and an elaborate system of sewerage has just been completed at a cost of over £100,000. There are winter gardens (1874), with an aquarium and a band pavilion seating 2000 persons; botanic gardens (1876), covering upwards of 20 acres, and containing a museum; and the Hesketh Public Park (1868) of 30 acres, with a meteorological institute. S. publishes 1 daily and 1 tri-weekly newspaper. Pop. (1851) 4765; (1871) 18,086. A small fishing-village at the commencement of the present century, S. is now a favourite winter resort for the surrounding manufacturing centres. Hawthorne, who resided here in 1856, describes it in vol. iii. of his *English Note-Books* (Lond. 1870).

South-Sea Bubble, the name given to the disastrous financial speculation which arose in England contemporary with the French Mississippi Scheme (q. v.). In 1711, Harley, Earl of Oxford, established the S.-Sea Company for the purpose of restoring the national credit, shaken by the downfall of the Whigs. Its privileges of trading in the S. Seas, although restricted by the Peace of Utrecht and interrupted by hostilities with Spain, appeared such as to make it a formidable rival of the Bank of England and the new E. India Company, which had obtained their privileges from the Whig government in exchange for large loans. In confronting with the then popular policy of reducing the national debt by incorporating it with the stocks of flourishing companies, an Act of 1717 allowed certain short annuities, with twenty-three years to run, to be transferred into S.-Sea stock, and this, added to advances, raised the company's capital to £11,746,844. But just as Law's scheme was at the height of prosperity, the S.-Sea Company enormously increased its scope.

A proposal to take over the entire public debt of £30,981,712, on consideration of 5 per cent., was accepted (2d February 1720) on a vote of the House of Commons, but only after the keen competition of the Bank had forced the company wildly to raise its terms, and to offer an advance of £7,567,000. Walpole, in supporting the Bank, warned the country against the 'dangerous lure to decoy the unwary to their ruin in the pursuit of imaginary wealth.' But the voice was unheeded, and the spirit of reckless speculation which had been spreading through England ever since the Revolution, found vent in this and the hundreds of mad schemes it drew in its train. Companies were formed for suppressing piracy, making quicksilver malleable, distilling oil from sunflowers, working a perpetual-motion wheel, &c. Two millions were solicited for floating a lucrative scheme, the nature of which was to be 'revealed hereafter.' The company's stock, originally 77½ per cent., rose from 126 in December 1719 to 890 on 2d June, and by midsummer had reached its maximum of 1000. Other stocks were similarly inflated by all the devices of stock-jobbing, and the advance on the stock of the three great corporations has been computed at 500 millions sterling, or five times all the cash in Europe. All at home scrambled helter-skelter after 'the vision of ingots.' Many foreigners followed the example, and the Canton of Bern speculated largely in the stock. The City was mobbed by the crowd of gamblers; the streets about 'Change Alley' were lined with desks, and in the wild confusion stock was sold at the same instant for 10 per cent. more at one end of the Alley than at the other. At last the crash came. The company, by *Scire Facias*, had swept away 86 of the more preposterous minor swindles, but instead of restoring credit this step helped only to precipitate the evil day. Stock fell faster than it had risen, dreams of El Dorado vanished, and ruin followed panic from one end of the land to the other. Public indignation burst forth; meetings in every considerable town petitioned the legislature for vengeance on the directors. The schism of the Whig party (1717) freed Walpole and those who were out with him from all responsibility for the disaster; had it been otherwise, a purely Jacobite party might have risen to power. Walpole, the chief critic of the company, applied the estates of the directors to the mitigation of distress. The whole sum of £7,000,000 which the company had engaged to pay the public, was remitted ultimately. A division of stock was made among all proprietors, and it produced a dividend of £33, 6s. 8d. per cent. Among the chief promoters of the company were Aislabie, the Chancellor of the Exchequer; Stanhope, the Secretary of State; and the two Craggs. Among the host of honest speculators, Pope, Walpole, Gay, Bingham, and Chandler. See Sinclair's *History of the Revenue* (vol. i. p. 488); Macfarren's *Annals of Commerce* (vol. iii.); Mackay's *Popular Delusions* (Lond. 1852); and Lecky's *Hist. of the 18th C.* (Lond. 1878).

South Shet'land, or **New South Shetland**, an island group in the Antarctic Ocean, 600 miles S. of Cape Horn (q. v.). The islands, lofty, rugged, and devoid of all vegetation save moss, are separated by a wide channel called Bransfield Strait from the Antarctic continent, here called Louis Philippe Land.

South'wark, a parliamentary borough in Surrey, and one of the great divisions of the Metropolis, extends along the S. bank of the Thames nearly opposite the City of London. For certain purposes it is within the city jurisdiction, and is presided over by an alderman. It returns two members to Parliament. Among its principal buildings are St. Saviour's Church, the third in importance of the metropolitan churches, Guy's Hospital, Bethlehem Hospital for Lunatics, Leather and Borough markets, and the termini of the London, Brighton, and S. Coast Railway, and the S.-Eastern Railway. The Surrey Commercial Docks and many manufactories of various kinds are in the borough. Pop. (1871) 208,725. See Rendle's *Old S. and its People* (Lond. 1878).

South'well, a market-town of Nottinghamshire, England, 8 miles W. of Newark by rail. Its noble cruciform minster, larger than many cathedrals, is 306 feet long by 60 broad, and 121 across the transepts. The Norman nave (1110), Early English choir (1233), and Decorated chapter-house (1294), have all been carefully restored during the last ten years, and £20,000 is still to be expended on raising the roofs to their original pitch and replacing the spires of the three Norman towers, 'whose grouping,' says Freeman, 'is as perfect as well can be.' £4000 has further been raised towards the erection of S. into a see, as proposed in the Bishoprics' Bill (1878). Pop. (1871) 3205.

South'well, Robert, born at St. Faith's, Norfolk, in 1560, was educated at Douay, became a Jesuit at Rome in his sixteenth year, and in 1583 was appointed rector of the English Jesuit College there. Next year he undertook a mission to England, and became chaplain to the Arundels. For alleged complicity in a plot against Elizabeth he was sent to the Tower in 1592, where he was confined three years, and put to the rack ten times. Finally he was condemned to death February 20th, 1595, and on the following day was hanged, drawn, and quartered. His literary compositions, chiefly poetical, and all on moral and religious subjects, have ever been in favour with Catholics. The chief are—*A Supplication to Queen Elizabeth* (1593); *Marie Magdalen's Funerall Teares* (1594); *Saint Peter's Complaynt* (1595); *Mæoniæ* (1595); *Triumphs Over Death* (1595); and *A Short Rule of Good Life*. His complete Prose Works appeared in 1828, and his Poetical Works in 1858. See Bishop Challoner's *Martyrs to the Catholic Faith* (new ed. Edin. 1878).

Souval'ki, a government of Russian Poland, bounded W. by E. Prussia, S. by Grodno, and separated by the Niemen on the N. from Kovno, on the E. from Wilna. Area, 4846 sq. miles; pop. (1870) 524,489. The surface is mountainous in the W. and S., and ⅛th is in swamp. Timber and grain are produced.—**S.**, the capital, is situated on the Hancza, 65 miles S.W. of Kovno. In 1872 the factories produced goods to the value of £91,320. Pop. (*St. Petersb. Cal.* for 1878) 15,585.

Souvestre, Émile, a popular French novelist, was born at Morlaix, in Britanny, April 15, 1806. Educated at the College of Pontivy on the death of his father in 1823, he studied law, and was received as an advocate at Rennes in 1827. Soon afterwards he went to Paris with a drama in verse, *Le Siége de Missolonghi*, which, however, was so severely treated by the censor that S. left the capital, becoming a salesman in a book-shop at Nantes. In 1836 he returned to Paris, and until 1848 took an active part in the *Révue de Paris* and the *Révue des Deux Mondes*. In 1848 he was appointed by Carnot to a lectureship in one of the schools appointed for the civil service, and in the same year he delivered a series of evening lectures to working men. In the summer of 1853 he lectured to the working classes in the principal towns of Switzerland, but his health giving way, he died at Paris, July 5, 1854. S., though deficient in invention and originality, is one of the most pleasant of modern French novelists, and one of the few who have, without didactic pedantry and affectation, constantly inculcated a high morality. His best-known works are *Un Philosophe sous les Toits*, *Au Coin du Feu*, *Sous la Tonnelle*, and *Confessions d'un Ouvrier*, which appeared in the *Magazin Pittoresque*; *Les Derniers Bretons* (4 vols. Par. 1835–37); *L'Echelle des Femmes* (3 vols. Par. 1835); *Mémoires d'un Sansculotte Bas-Breton* (3 vols. Par. 1840); *Le Monde tel qu'il sera* (Par. 1845–46); *Le Roi du Monde* (2 vols. Par. 1852); *Causeries Historiques et Littéraires* (2 vols. Par. 1854).

Sov'ereign, the name of British gold coin of currency, valued at 20 shillings, or one pound sterling, and having a standard weight of 123·374 grs. The name was first used in the reign of Henry VII., but lasted only a short period. It was revived in 1817 under George III., and the new gold piece then issued was substituted for the guinea.

Sow'erby Bridge, a manufacturing town in the W. Riding of Yorkshire, 27 miles E. of Todmorden, and 4½ S.W. of Halifax by rail. It has grown up where the road from Halifax to the ancient village of S. crosses the Aire. In the parish church of St. George's is a monument to Archbishop Tillotson, who was born at S. There is a fine town-hall (1857), and a new railway station was opened in 1877. A railway from here to Rochdale is in course of construction, and plans are now (December 1878) being prepared for dealing with the sewage. Cotton-spinning, woollen manufacture, and dyeing and chemical works are the chief industries. Pop. (1871) 7041.

Sow'ing and Sowing-Machines. S. is the operation of scattering seed on the ground for propagation. Formerly seed, held in a basket or S.-sheet, was thrown broadcast from the hand, and this primitive method of S. is still practised in some parts of Scotland. Machines on the 'broadcast' and 'drill' principles are, however, rapidly superseding it, and on large farms in Britain they are universally employed. There are many forms of these S.-M., each of which presents some special advantage in simplicity, durability, economy, or efficiency in sowing certain or

all kinds of seeds, or adaptation to different kinds of land. Most of the cereal crops are sown by means of the broadcast machine in Scotland. In general construction this machine consists of a narrow seed-box 15 to 20 feet long, in one length, or in sections capable of being folded up for convenience in transport, mounted on a framework supported on two or three wheels. The box, or each of its sections, has a revolving spindle passing through it, which receives its motion from the wheels, and which carries a number of cog-wheels, discs, or brushes for discharging the seed through a like number of orifices at the bottom of the seed-box on to a distributing 'apron,' whence it falls to the ground. Covering slides are furnished for the orifices to reduce their number or their size, so as to secure the discharge of a required quantity of seed per acre. Some machines have a contrivance whereby a horizontal position is maintained while passing over hilly or uneven ground. The seed is covered with soil by subsequent harrowing. Ground intended to be sown by a drill S.-machine is carefully and evenly cultivated beforehand. The drill is supposed to have been invented in Italy in the 16th c. Jethro Tull constructed one in England in 1730, and since then the machine has been vastly improved. Sowing in drills is widely practised in England. It presents advantages over broadcast S. in the saving of seed, in the deposition of the seed at a uniform depth, and in the facilities offered for keeping down weeds. The common East Lothian drill S.-machine has a seed-chest with a revolving shaft and toothed wheels for driving the seed through orifices into hoppers which feed-tubes carried down to the drills. Six coulters depend from the bed-frame of the machine, and their lower ends are furnished with rivetted cheeks forming pointed sheaths which penetrate the ground and cut parallel rows or drills, and into these the seed is delivered by the tubes. There is considerable variety in drill S.-M. In the 'Suffolk Lever Corn-Drill,' extensively used in the eastern counties of England, the delivery of the seed is effected by a series of cups attached to a disc revolving in the seed-chamber. The cups empty the seed into shoots, which convey it to the coulters through tubes. Drill S.-M. have an arrangement in common whereby the delivery tubes and coulters may be raised or lowered and the seed-barrels thrown out of gear; and many are adapted for sowing all kinds of seeds at any required rate of distribution, and also for a simultaneous deposition of manure. *Dibbling* is a method of sowing beans or potatoes in holes.

Sow Thistle, the common *Sonchus oleraceus*, belongs to the natural order *Compositæ*. There are about 40 species widely diffused through the N. and S. temperate regions. Some are annual, others perennial. The leaves are toothed or pinnatifid; the flower-heads yellow; fruit truncate, compressed, with simple, silky pappus-hairs. *S. oleraceus*, and one or two other species, were formerly served as salad plants. Three species are natives of Britain, besides the handsome allied *Mulgedium alpinum* (or blue S. T.) of wet alpine rocks in Forfar and Aberdeen.

Soy, the Japanese name of a condiment in general esteem for flavouring purposes, and supposed to favour digestion. Its principal ingredient is the seed or 'bean' of *Glycine soja* (or *hispida*), a native and a cultivated annual of E. Asia. This seed resembles a small kidney bean, and is a very nutritive food—too rich to be used alone. The chief seat of cultivation is N. China and Japan, whence the seed is largely exported to the southern parts of the country: it is calculated that 3000 junks are employed in the trade. The process of making S. is to boil the beans with an equal quantity of barley or wheat, leaving the mixture for three months to ferment, adding salt and water, and then straining the liquid through a thick cotton bag. In 1874 the Japanese product of S. amounted to 1,506,402 hectolitres.

Spa, a famous watering-place in Belgium, province of Liège, in the beautiful valley of the Wayal, 27 miles S.E. of Liège by rail. It is well built, and contains a large number of fine hotels. An Anglican church was erected in 1875. Its chalybeate springs attract during the season (from May to October) many thousand strangers. The waters are full of carbonic acid gas, and contain carbonate of iron, soda, lime, and magnesia. The most frequented springs are—Pouhon, Sauvenière, and Groesbeck, 1½ miles distant; Geronstère, with a slight sulphur taste, 2 miles distant; Barisart, 1 mile; Tonneleto, 1 mile, and the two Prince de Condé springs, much frequented since 1863. The waters of the Condé and Pouhon springs are largely exported. S. manufactures wooden toys, which are stained brown in the mineral waters. Pop. 5881.

Space and Time have received almost as many philosophical definitions as there have been philosophers. The simplest definition is that of Leibnitz—that space is the order (or correlation) of things coexisting, and time the order of things successive. Another well-known definition of time makes it 'duration limited,' while Aristotle made it physically, rather than philosophically, 'the measure of motion.' Locke affirms that the idea of space is given by sensation, especially by the senses of touch and sight. Reid, Cousin, and Royer-Collard make it an *à priori* notion of the mind. With Kant, S. and T. are forms of sensibility. By means of external sense we represent to ourselves things as in space, and by means of internal sense things as related to each other in time. Thus they are made to be conditions of subjective sensibility, without any necessary objective reality.

Whatever the origin of the idea of space may be, its attributed properties are generalisations from experience. Thus to fix a point in space three numbers are necessary and sufficient (see CO-ORDINATES), and the volume of a given portion of space is measured by its extensions in any three arbitrary directions, chosen so as not to be in the same plane. This threefold character is essential, and consequently space, as we know it, is tri-dimensional. It is possible, however, and mathematically conceivable, that space may exist which has not these properties. For instance, mathematics deals with what is known as space of one dimension or of two dimensions. A given curved line is an example of the former, since to fix a point in it only *one* number is required, its distance along the curve from an arbitrarily chosen point. A surface again typifies space of two dimensions, since, to fix any point upon it, two numbers are necessary and sufficient. Now a solid is limited by surfaces, a surface by lines, a line by points. Hence generalising, we educe the proposition that space of three dimensions is bounded by space of two dimensions, space of two dimensions by space of one dimension, and space of one dimension by space of no dimensions. Reasoning in the other direction, we find that space of three dimensions may bound space of four dimensions, though to conceive of such a higher order of space is beyond our comprehension. Such speculations, though apparently wild and useless, may in the course of events touch us closely—and in other words, our system of worlds may come to a region of space, in which the properties of tridimensional space may be completely altered. Something may take place analogous to the crumpling or twisting of space of two dimensions in space of three dimensions, the properties being changed, and yet the space remaining of the same dimensions as before. The investigation of the necessary properties of four-dimensional space has occupied the attention of some of our first mathematicians, Riemann, Helmholtz, Clifford, and others.

Spade'-Husbandry is the culture of land by means of the spade and other manual implements. On account of its practice on cottage farms and the resemblance of its field operations to those of gardening (see HORTICULTURE), S.-H. is also known by the names of cottage-farming and field-gardening. Where steam and horse culture are impracticable S.-H. yields excellent results, and on small and even large farms whose soil admits of digging at all seasons it is the most profitable method of culture. Much waste land has been reclaimed by means of S.-H., notably in Cornwall and the Isle of Axholme, Lincolnshire. The spade possesses advantages over the plough for cultivation on account of the facility of replacing, by deep digging, an exhausted layer of soil by a subjacent layer, fresh and naturally rich, and made more so by manure applied above and washed down.

Spagnolett'o, Lo ('the Spaniard'), the name bestowed on José Ribera, the famous painter, during his residence in Italy, and that by which he is most widely known. Born at Jativa (San Felipe), in Valencia, 12th January 1588, he was a pupil of Ribalta, but passing early to Italy he entered the studio of Caravaggio, and later modified his style by study of Raphael and Correggio. About 1612 he settled in Naples, where he was made court-painter, and died about 1656. A painter solely of easel-pictures, S. is specially notable for a tendency to over-realism (as in 'The Flaying of St. Bartholomew'), coupled with masterly chiaroscuro and anatomy. 'Ixion on the Wheel,'

'Jacob's Dream,' and 'Adoration of the Shepherds', are among the chief of his works, many of which are at Naples, Madrid, Paris, Dresden, and Vienna. S. entertained Velasquez at Naples, and among his pupils were Giordano and Salvator Rosa.

Spa'hi, or Sipa'hi. See SEPOY.

Spain (Span. *España*), a kingdom of S.W. Europe, occupying five-sixths of the Iberian peninsula, bounded N. by the Bay of Biscay and the Pyrenees, E. by the Mediterranean, S. by the Mediterranean, the Straits of Gibraltar, and the Atlantic, and W. by Portugal and the Atlantic. Its extreme points are Cape Vares in the N., Cape Crens in the E., the Hermita de Santa Catalina in the S.; and Capes Toriñano and Finisterre in the W. The census of 31st December 1877 makes the pop. 17,000,900. The census of 1860, corrected by the returns of births and deaths from 1861 to 1870, is as follows:—

Provinces.	Area in sq. miles.	Pop.	Provinces.	Area in sq. miles.	Pop.
New Castile—			*Andalusia—*		
Madrid . .	2996	484,541	Córdoba .	5300	383,472
Guadalajara	4867	208,561	*Granada—*		
Toledo . .	5583	340,742	Granada . .	4937	483,415
Cuença . .	6725	238,938	Almería . .	3302	360,517
Ciudad-Real	7840	265,022	Málaga . .	2822	502,378
Old Castile—			*Valencia—*		
Búrgos . .	5651	355,793	Valencia .	4350	661,250
Logroño .	1955	183,205	Alicante . .	2098	437,856
Santander .	2112	240,172	Castellón .	2447	294,555
Oviedo . .	4089	605,353	Murcia . .	4476	438,013
Soria . . .	3834	158,992	Albacete .	5971	221,089
Segóvia . .	2712	152,474	*Catalonia—*		
Avila . . .	2981	175,513	Barcelona .	2985	751,129
León . . .	6166	351,392	Tarragona .	2450	347,591
Palencia . .	3125	189,393	Lérida . .	4775	330,447
Valladolid .	3041	246,708	Gerona . .	2172	323,257
Salamanca .	4037	281,761	*Aragon—*		
Zamora . .	41[illegible]3	255,784	Zaragoza .	6504	402,713
Galicia—			Huesca . .	5875	275,097
Coruña . .	3078	627,479	Teruel . .	5481	251,909
Lugo . . .	3785	474,286	*Navarra* . .	4054	318,954
Orense . .	2737	401,857	*Guipuzcoa—*		
Pontevedra .	1738	479,076	Alava . . .	1205	103,341
Estremadura—			Biscaya . .	848	187,628
Badajos . .	8687	431,124	Guipúzcoa .	728	180,105
Cáceres . .	8013	301,506	*Islands—*		
Andalusia—			Baleárés . .	1859	288,747
Sevilla . .	5426	509,001	Canárias .	2807	283,402
Huelva . .	4122	194,529			
Cádix . .	2828	421,666	Total	275,881	16,794,963
Jaén . . .	5184	393,230			

Physical Aspect.—S. may be described generally as a highland country, the centre of which is occupied by a great plateau of 42,500 sq. miles, sloping from E.N.E. to W.S.W., which is nearly equally divided by the Sierra Guadarama (8223 feet) and the Sierra de Gredos (8725 feet) into a N. table-land, comprising the highlands of Old Castile and Leon, and a S. embracing New Castile and Estremadura. The N. plateau, averaging 2723 feet in height, is composed of the grass-grown terrace of Reinosa (3280 feet), the barren but populous plateau of Soria (3610 feet), the level and fertile Bureba, the hill-country of Burgos and Lerma, the treeless corn-lands called the 'Tierras de Campos,' and the rich but little-cultivated plain of Old Castile; while the S. plateau, averaging 2230 feet in height, embraces the basins of the Tajo and Guadiana, parted by the Sierra de Toledo (4264 feet) and the Cabeza del Moro (5110 feet), and made up of the table-lands of Setiles and Siguenza to 3936 feet in the N.E., the barren plain of Madrid, the fertile lands of Alcarria and Requina; in the S.W. the 'Dehesas de la Sierra,' and in the N.W. the oak woods and heaths of Upper Estremadura. These table-lands, the largest and loftiest in Europe, are for the most part dreary, treeless flats, which justify the epithet of 'tawny S.,' and explain the saying that 'Africa begins at the Pyrenees.' The N. boundary of the great central plateau of S. is the Cantabri-Asturian range, which begins at the frontier-stream of Bidassoa, and, running due W. parallel with the N. coasts for 260 miles, terminates in great mountain masses in the kingdom of Galicia. Its E. boundary is the great Iberian system, a mass of chains, groups, and single peaks, separated by table-lands and wide valleys including all Valencia and S. Catalonia, and the E. part of both Castiles, an area of 30,800 sq. miles. To the N.E. is the Ebro basin (12,700 sq. miles), embracing part of Alava, S. Navarra, and Lower Aragon, and bordering on the N. and N.E. on the mountains of Navarra, Upper Aragon, and Catalonia, which run nearly parallel to the Pyrenees (q. v.). Its S. limit is the Sierra Morena, which separates it from the mountains of Granada and Andalusia, and the basin of the Guadalquivir (6400 sq. miles); on the W. it slopes to the plains and valleys of Portugal. Upper Andalusia is filled by the Sierra Nevada (q. v.), to the W., N., and N.E. of which lie the plateaux Ronda, Granada, Baza, Huesca, and Murcia. A coast range stretches from Cape de Gata to near the Straits of Gibraltar. Of the five great rivers of S., the Douro, Tagus, Guadiana, Guadalquivir, and Ebro, only the last three are navigable. All the rivers are rapid, and vary greatly in volume. For irrigation the numerous coast streams are peculiarly valuable. There are many fine natural harbours. The number of small salt lakes in S. is very great, and the mineral wells are estimated at 1500.

Geology and Mineralogy.—The extreme N.W. of S. consists of masses of granite, gneiss, and other igneous rocks. These are succeeded in the E. by Silurian strata, stretching first S., then E., and inclosing the extensive Tertiary formations that cover the greater part of the central plateau. The N. boundary of this plateau is partly Carboniferous, partly Jurassic, but the latter is more characteristic of its E. boundary, which divides the basins of the Ebro and Duero. The Ebro basin is mainly Miocene, but older formations crop up on the flanks of the Pyrenees and along the coast to the mouth of the river. To the S. of the Guadalquivir the formations, save the Silurians of the Sierra Nevada, belong to the Secondary groups of the central plateau. The great mineral wealth of S. is out of all proportion to the mining industry. Of the few ironworks, La Felguerra, in the Asturias, the most important, in 1876 employed 1992 workmen, and along with the Vega works had 39 steam-engines, and turned out 20,700 tons of pig and 14,000 tons of rolled wrought iron. In March 1876 King Alfonso found 100,000 tons of iron ready for transport at the Goldames mines. S. in 1877 produced 560,000 tons of coal, of which the Asturian mines yielded 400,000 tons. Considerable beds of coal were discovered in 1878 near Puerto Llano, about 25 miles from Ciudad-Real. The output of the Rio Tinto cupreous sulphur ore mines was in 1877 estimated at 660,000 tons. These mines, which employ 5000 men, and are connected with Huelva by a railway 52 miles long, were in 1873 bought from the Government by an Anglo-German company for £3,850,000. From the Buitron and Poderosa mines were shipped, in 1876, 51,872 tons of copper ore. The quicksilver mines of S., now in the hands of Messrs. Rothschild, produce annually 40,000 flasks. The other chief minerals are silver, arsenic, lead, zinc, manganese, alum, vitriol, sulphur, and salt.

Climate, Botany, and Zoology.—While the S.E. coast on the Mediterranean, protected by the mountains of Upper Andalusia, has an average temperature of 68° F., the climate of the highest mountain-land answers to that of the polar zone, that of the Pyrenean and Asturian districts to the N. temperate, and that of the rest of the country to the S. temperate. Andalusia, almost tropical, is exposed to the *Solano*, a withering, fever-laden wind of Africa. But several towns on the Mediterranean, particularly Valencia and Malaga, are favourite winter-resorts of invalids. On the plateaux a thunderstorm sometimes causes a fall of from 86° to 48° F. The sudden changes of temperature account for the aristocratic *capa* and the plebeian *manta* in general use throughout S. The great desideratum of the interior is moisture. The luxuriant coast-strip from Murcia up to Catalonia, called 'the garden of S.,' is almost equalled in fertility by the narrower strip from Murcia to Malaga. The Cantabri-Asturian chain is the region of the oak, chestnut, beech, apple, wild rose, hawthorn, blackberry, carob, and Spanish cane. The Pyrenees present coniferæ, and Alpine shrubs and herbs. The central plateaux are covered with rosemary, lavender, and *Ericaceæ*, and the mountain-lands that skirt them with forests of the cork-tree, pine, fir, juniper, chestnut, ash, and ilex. In the E. the plains bear the *Gypsophyla hispanica*, *Helianthemums*, and *Ericaceæ*, and the mountains are clad with the oak, beech, ash, alder, box, and pine trees. In the S. flourish the cork-tree, the orange, the sugar-cane, cotton, opuntia-cactus, banana, indigo, coffee-plant, and several fruit-bearing palms. The forests in S. cover (1878) 21,335,156 acres, of which 16,691,453 are crown property. Besides the deer, the wolf, and the bear, the wild animals of S. include the chamois, mountain-goat, lynx, wild-cat, fox, wild-boar, rabbit, squirrel, and marmot. Well-watered districts abound with ducks, geese, swans, storks, cranes, flamingoes, &c.

There are great swarms of grasshoppers, and on the Mediterranean coast occurs the false cochineal insect. The Spanish fly is an article of commerce. Sardines and tunny-fish are caught on the coast, oysters at Agamonte, and a coral-fishery is carried on along the coast of Andalusia.

Industry and Trade.—Wherever the requisite moisture is present, wheat, wine, and oil are produced, but irrigation is sadly defective. Only 44¾ per cent. of the surface is under cultivation, 26$\frac{1}{10}$ per cent. being tilled or gardenland, 2¾ vineyards, 1$\frac{7}{10}$ olive groves, 13$\frac{7}{10}$ meadow or pasture. The annual production of wheat, rye, barley, oats, buckwheat, millet, maize, and rice is about 31,000,000 quarters. There is the greatest variety of garden fruits and vegetables, including grapes, apricots, peaches, figs, almonds, pomegranates, melons and tomatoes, the white mulberry and the sugar-cane, of which last the yield in 1877 was estimated at 44,000,000 lbs. As many as 16,500 lbs. of strawberries are sometimes brought to the Barcelona market on a single day. Hemp, flax, madder, woad, saffron, cummin, liquorice, and rape are largely cultivated. Esparto grass grows wild in the south. S. is only second to Italy among the silk-producing countries of Europe. In 1876, the raw silk produced in S. was 188,100 lbs. S. had, in 1873, 680,373 horses, 2,319,846 mules and asses, 2,967,303 head of cattle (780,000 were in 1878 in the Asturias and Galicia alone), 22,468,969 sheep, and 4,351,736 swine. The abolition of bull-fights, which yearly destroy 3000 to 4000 horses, was recommended by the Cortes of 1878. Small black swine are largely reared in Andalusia, and goats (about 3,000,000) in Valencia, and on the Sierra Nevada and the Pyrenees. The chief manufactures are iron and copper wares, stoneware, fayence, lace, woollens, linens, and machinery. Shipbuilding is carried on at the large seaports. The tobacco manufacture, a state monopoly, is restricted to seven great factories. The chief occupation in the interior is the rearing of enormous flocks of the valuable merino sheep. The failure in recent years of the vine crop has led to the experiment of making wine of oranges, and the first yield of the new product was favourably reported on at Valencia in November 1878. From 1867 to 1876 the exports of S. averaged £16,000,000 annually, the imports £12,000,000. The imports of S. from the United Kingdom in 1877 amounted to £4,267,214, chiefly linen-yarn, linens, cottons, woollens, iron, coal, and machinery. The exports to the United Kingdom amounted to £10,842,097, and comprised wine (white, 5,542,986 gals. = £1,855,212; red, 1,260,808 gals. = £151,900), pyrites of iron and copper (£1,177,621), copper ore and regulus (£467,802), iron ore (£983,561), oranges and lemons (£857,977), raisins (£623,950), almonds (£64,401), nuts (£174,956), and other fruits (£255,480), esparto (£429,647), silver ore (£414,075), wheat (£316,586), wheaten flour (£403,896), cork (£95,307), olive-oil (£55,289). The export of iron to Tyne and Tees ports in 1876 was 64,707 tons. The merchant navy of S. consisted, on January 1, 1877, of 2915 vessels of 557,320 tons, including 230 steamers, of 176,520 tons. Madrid, the capital, is far excelled in trade and industry by Barcelona, the 'Spanish Manchester.' Seville, which has the largest tobacco-factory in Europe, is world-famous for its oranges as Malaga is for its wines and raisins.

Constitution, Finances, Railways, &c.—By decree of June 30, 1876, S. is a constitutional monarchy. The legislative power is vested in the King and a Cortes of two houses. The Senate is made up of three classes, each limited to 180: (1) princes of the blood, the grandees, and chief functionaries; (2) life senators appointed by the Crown; (3) members elected by the corporations and leading citizens; the Chamber of Deputies is elected for five years in the proportion of two to every 50,000 inhabitants. The Executive is vested in a council of nine responsible ministers. The budget for the year ending June 30, 1878, showed a revenue of £29,434,746, and an expenditure of £29,431,007. The total public debt on the 30th June 1876 was £486,341,102, the interest on which amounted to £11,116,092. On January 1, 1876, the total length of railways was 3810 miles (1264 miles being in course of construction); and of the lines of telegraphs 7610 miles. An extradition treaty with Britain came into effect 9th December 1878.

Army and Navy.—By the law of 1872 there is universal obligation to military service after the age of twenty. The service extends over 8 years in S., and 4 in the colonies. The strength of the army in 1877 was 151,668. In 1844-45 was organised the *guardias civiles* (20,000 foot and 5000 horsemen), through whose exertions brigandage has almost disappeared. In June 1877 the navy consisted of 81 steam-vessels of 800 guns, and 8 sailing-vessels of 122 guns, manned by 9750 sailors and 5550 marines. For the colonies S. maintains a fleet of 35 gun-boats.

Ethnography, &c.—The Spanish nation is formed chiefly of Castilians, Murcians, and Andalusians. The direct descendants of the Moriscos or Modejares are reckoned at 60,000. The Basques, with a distinct language, are about 500,000. The Galegos, in Galicia, speaking a dialect liker Portuguese than Spanish, number 2,000,000. In the heart of the country are 40,000 gipsies. The nation is socially divided into five classes—nobles, clergy, burgesses (one-seventh of the whole), farmers, and day-labourers. The higher nobility include the 'grandees' and the 'Titulados del Reino,' the lower one the 'Hidalgos,' a numerous but impoverished class. The Basques and Asturians generally designate themselves 'Nobles.' S. is pre-eminently the land where 'manners makyth man,' for there civility and ceremony are dear alike to beggar and grandee. Characteristic also is the wide prevalence of almsgiving, the nurse of idleness and beggary.

Religion and Education.—The established religion is the Roman Catholic, professed by all the people save 60,000. Other religions are nominally tolerated. There are nine bishops, 45 suffragan bishops, 40,000 secular clergy, 719 monks, and 12,990 nuns. Before 1841, when most of the monasteries were confiscated, the monks numbered 30,000. Thirty years ago there were in S. scarcely 1000 schools. Primary education was in 1869 made free and compulsory. In 1872 there were in S. 22,625 public primary schools, with 1,187,459 pupils, besides 5135 private schools, with 194,519 pupils; 31 teachers' training-schools, 63 *institutos de segunda ensenanza*, with 30,000 pupils, and 1327 pupils in special practical schools. There are 10 universities, Barcelona, Granada, Madrid, Oviedo, Saragossa, Salamanca, Santiago, Seville, Valencia, and Valladolid. In 1878 there were in all 414 professors (76 at Madrid) and 15,000 students.

Colonies.—Besides the Balearic Islands, the Canaries, and the penal establishments ('Presidios') in N. Africa, S. possesses in Africa the islands Fernando Po, Corioco, Elobey or Morisco, Annobon, and the territory at Cape San Juan; in America, Cuba and Porto Rico; in the Pacific, the Philippine Islands, Caroline, Pelew Islands, and Marianne or Ladrone Islands. S., alone of European states, still tolerates slavery in its colonies.

History.—The peninsula known to the Greeks as Iberia, and to the Romans as Hispania (q. v.), has been subject to a greater number of revolutions affecting the dominant race than any other country of modern Europe. The primitive *Iberi* or Basques (q. v.) were in part driven into the mountains by an invasion of Celts, and in part were assimilated by their conquerors. This mixed Celt-Iberian race occupied the whole peninsula when it first becomes known in history. The Phœnicians, lured hither by the precious metals which early made S. the El Dorado of the ancient world, settled in considerable numbers round the coast, and their language and manners penetrated far into the interior. But the conquest of S. was reserved for the Cathaginians, who long maintained a strong military force in Gadeira (Cadiz), and after the First Punic War began the work of subjugation. (See HAMILCAR and the HASDRUBALS.) A treaty of peace between the Romans and Hasdrubal, son-in-law of Hamilcar, stipulated that the Carthaginians should neither molest Saguntum nor cross the Iberus (Ebro). Hannibal (q.v.), violating these conditions, precipitated the Second Punic War, in which the military genius of Scipio (q.v.) effected the expulsion of the Carthaginians from Europe in 206 B.C. Although the Romans chose to regard the whole land as conquered, their power was not confirmed till after a protracted struggle of two centuries. The southern region was early reclaimed to Roman civilisation, and mixed colonies rapidly springing up, the union of Rome with this its richest province became eventually more complete than with any other. As no other province contributed so much to the material resources of the empire, so none received so liberal a share of power and dignity. The first foreign consul was Balbus of Cadiz; the first foreign emperor, Trajan, a native of Italia, near Seville. The grand remains of amphitheatres, aqueducts, bridges, &c., attest the development of the country which furnished Rome with treasure of gold and silver as well as with vast grain supplies. From Constantine's death (337) the general prosperity began to wane.

Christianity had been introduced by the 2d c., and its gradual diffusion hastened the decay of Roman authority. In the beginning of the 5th c. took place the great irruption of the Northern barbarians. First the Vandals, then the Alans and Sueves passing the Pyrenees, carried throughout S. bloodshed and pillage. The Vandals crossing into Africa (412), were succeeded by the West Goths, who had already been converted to Christianity (see GOTHS). The Gothic monarchy is interesting mainly as the primary source of the constitution of Castile. Succession was not hereditary but elective; laws enacted in national councils of prelates and nobility were sometimes even ratified by public assembly. Civil liberty was enjoyed in a greater degree by the Romanised inhabitants than under the other barbarians of the North. After three centuries of Gothic rule, S. fell suddenly under the yoke of the Arabs. Roderic (q. v.) risked his kingdom on a single battle, and three years from their victory at Xeres (711) the Arabs and the Moors (q. v.) had reduced the whole of S. except the mountainous N.W., the retreat of Pelayo and a large body of Christians. Military success heralded brilliant progress in refinement and culture. From about 750 till its re-conquest by the Christians, Cordova (q. v.), identified with the names of Avicenna and Averroes, was the brightest intellectual centre of Europe. Later it was surpassed by the kingdom of Granada (q. v.), if not in literary and scientific fame, at least in splendour and luxury. Saracenic architecture, which found its grandest expression in the airy pile of the Alhambra (q. v.), left its traces on the ambitious structures of Venice and Lombardy. First held as a dependency of the Arab province of N. Africa, S. from 717 was ruled by emirs under the Calif of Damascus. In 756 Abderrahman, the last of the Ommiades (q. v.), made Cordova an independent Califate. Those of the native Christians (called Mozárabes) who continued to dwell among the conquerors were allowed to retain their religion and special tribunals, on the payment of double tribute and a tax on church property. Meantime the Arab rulers sank into effeminacy, forgetful of their hardy enemies in the Asturias (q. v.). Rebel governors dismembered their kingdom by forming the states of Toledo, Huesca, Saragossa, &c., and these in their internal contests occasionally sought the alliance of the Christian princes. On the S. slopes of the Pyrenees the kingdoms of Aragon (q. v.) and Navarre (q. v.) silently formed after the fashion of the Asturias. Leon (q. v.) in 914 had extended its frontier to the Duero, and even to the Guadarama range. In the beginning of the 11th c. Sancho the Great, King of Navarre and Aragon, placed over Castile (q.v.) his son, Ferdinand, who assumed the title of king, and by marriage temporarily added Leon to his possessions. The cessation of internal hostilities brought about by this union, enabled the Christian states to assail their enemies more vigorously. With valour inspired by the example of the Cid (q. v.). and ennobled by the customs of chivalry, the Spaniards were everywhere victorious, and by 1085 Alfonso VI. had recovered Toledo, the metropolis of the Gothic monarchy. Calamities scarcely inferior fell on the Moors in a different quarter. The kings of Aragon, beginning by successful attacks on their neighbours, gradually seized one after another of the Moorish towns, till in 1115 they crowned their conquests with the capture of Saragossa. The rapid progress of the Christian arms was partly due to the obligation of military service on chartered towns and communities, and partly to the power of the great military orders, notably those of St. John and the Knights Templar. Driven into narrow compass and exasperated by defeat, the Arabs sought the ready aid of their Moorish co-religionists across the straits. The Almoravides (q. v.) and Almohades (q. v.), fanatical, warlike sects, appeared successively first as the defenders and then as the masters of Mohammedan S. Under the Almohades the Moors sustained a tremendous defeat at Baños di Tolosa, near Baylen, in 1210, when, according to a letter from Alfonso, the victor, to Innocent III., the loss of the Infidels amounted to 180,000 men. In 1236, Ferdinand III., bursting into Andalusia, took Cordova, and a few years later Seville, the favourite region of the Moors on the Guadalquivir. Ferdinand, in 1238, reunited for ever the two branches of the Gothic monarchy, Leon and Castile. Jayme I. of Aragon, the Conqueror (1213-48), reduced the city and kingdom of Valencia, the Balearic Isles, and Murcia. But by the cession of Murcia to Castile, Aragon shut itself out from the possibility of extending its landward conquests. Its ambition was thenceforth diverted to objects beyond the Peninsula, and its dominion was extended to Sicily in 1282, to Corsica and Sardinia in 1297, and to Naples in 1442. After the fall of the Almohades, the king of Jaen founded (1235) the kingdom of Granada (q. v.), which shortly became tributary to Castile. From this period ended all fear of Moorish supremacy. But the Moors, retaining Gibraltar, Algeziras, Tariffa, and other strongholds, were abler to resist; the Castilians, gratified by success, sank into characteristic indolence. Disputed successions, court chicane, the ceaseless clang of civil arms, make up the history of Castile till the union of S. by the marriage of Isabella (q. v.) with Ferdinand (q. v.) the Catholic of Aragon in 1469. The same year saw the final overthrow of the Moors and the discovery of the New World. The latter event brought wealth and glory to S., and led to a mighty extension of her domain, but it also withdrew the ablest of her sons, who in the wild pursuit of an imaginary El Dorado left undeveloped the rich resources of the mother-country. Advised by Ximenes (q. v.), Ferdinand and Isabella centralised in the crown the judicial authority and the powerful religious orders of Alcantara, Compostella, and Calatrava. They supported the Inquisition and the Hermandad (q. v.), attempted the conversion of the Moors, and hurt the trade of S. by expelling the Jews, guided by the desire to make the Church the basis of the throne. A policy which ended by bringing S. more completely under papal control than any other state, for the time gave her the semblance at least of vigour and solidity. Juana, the only surviving child of Isabella, and the wife of Philip the Handsome, son of the Emperor Maximilian I., succeeded to Castile in 1504. On the death of Ferdinand in 1516, Charles I. (Karl V.) became the first king of all S., which during his long reign attained the height of her outward prosperity. Through his father, Philip, Charles inherited the Netherlands and Franche-Comté, and his dominion was further increased by the conquest of Mexico and Peru. He was elected Emperor in 1519, and directed his arms successfully against the French, the German Protestants, and the Turks. The champion of the Roman Catholic faith, S. was now the enemy of civil and religious liberty. Spanish cities were stript of their rights, the whole kingdom was burdened with taxes, science and literature were paralysed, and death was the award of heresy. Already had the decline of S. begun when Philip II. (q. v.) received the crown in 1556. Wealth derived from the vast American possessions, Philip squandered in promoting the true faith by hapless military enterprise. He united Portugal to S., but in spite of the ability of Alba (q. v.) he lost the N. provinces of the Netherlands (1579). His war against Henri II. and the Protestant Bourbon (see HENRI IV.) were barren of gain, and the 'Invincible' Armada (q. v.) became a monument of national folly. The gloomy despotism of Philip was followed by the ruinous reign of the weak Philip III. (1599-1621), which witnessed the expulsion of the Moriscoes, comprising over a million of the most industrious inhabitants of S., and the subversion of every interest to that of the clergy. Philip IV. (1621-68), the tool of Olivarez (q. v.), lost Portugal in 1640, and Franche-Comté, 1669, and was forced to own the independence of the Netherlands. English and Dutch buccaneers swept Spanish trade from the seas, the finances were thrown into confusion, and civil war raged in Catalonia, Andalusia, and Naples. Under Charles II. (1668-1701) S. had sunk to the lowest ebb, and the very existence of her people was threatened by famine. The death of Charles, last of the Hapsburg dynasty, without heir, led to the Succession War (q. v.), which ended (1713) in the recognition of Philip V., the first of the Bourbons, and the cession of Naples, Sardinia, Milan, the Spanish Netherlands, Sicily, and Gibraltar. Counselled by the daring Alberoni (q. v.), Philip formed a league with Peter the Great and Karl XII. of Sweden against England, but the disclosure of the plot was followed by the Quadruple alliance (1718). The revival of trade and industry, begun under Philip, took a fresh impulse from Charles III. (1759-88), who restrained the Inquisition, expelled the Jesuits (1767), induced immigration, and concluded peace with the African corsairs. Godroy (see ALCUDIA) is mainly responsible for the inglorious conduct of Charles IV., by which S. became one of Napoleon's reserves. The proposed partition of Portugal (1807) called forth the Prince of the Asturias as a rival to Charles, and Napoleon, arbitrating at Bayonne, set aside both claimants in favour of his brother Joseph Bonaparte. On the rising of the people, who sided with the Prince of the Asturias' as Ferdinand VII., Joseph fled from Madrid, but only to return, backed by Napoleon (q. v.) with a large army.

England joined the patriots in the Peninsular War (1808), in which the French victories of Medellin and Cadiz were more than counterbalanced by those of the allies at Vimiero, Talavera, Salamanca, and Vittoria. Wellington (q. v.) having driven Soult (q. v.) into France, the Treaty of Valençay was concluded 11th December 1813. Napoleon relinquished S., and Ferdinand VII. (q. v.) began a reign of repression and bigotry. In 1820 an armed revolt procured the adoption of a liberal constitution, but a terrible reaction preceded the attempts to place Don Carlos (q. v.), Ferdinand's brother, on the throne. Maria Christina (q. v.), queen-regent, plunged S. into war with the Carlists, but in 1840 she resigned, and Espartero (q. v.) made an effort to revive the national life. Isabella (q. v.), declared of age 1843, adopted a policy of reaction, under guidance of one favourite after another—Serrano (q. v.), Narvaez (q. v.), Bravo, Murillo, &c. A revolt under O'Donnell (1854) induced Isabella to recall Espartero, and establish Christina beyond the frontier. The unsettled state of S. was reflected in her colonies; Peru achieved independence (1864–65), and Chili (1865). In 1868 Isabella was driven from Spain, Prim (q. v.), the Duc de Montpensier, and other exiles returned, an advanced liberal constitution was adopted by the Cortes, and Serrano acted as regent till the election of Amadeo (q. v.) as king in 1870. On the withdrawal of Amadeo, the Carlist insurrection spread rapidly, adding to the confusion into which S. was cast during the infirm tenure of the Republic of 1873 and the dictatorship of Emilio Castelar, the brilliant republican orator. Prince Alfonso (q. v.), son of Isabella, was proclaimed king in 1874, and succeeding in reconciling various parties, directed a superior force against the Carlists, whom he finally quelled in the spring of 1876. In January 1878, Alfonso married Maria de las Mercedes, daughter of the Duc de Montpensier, who died in June following. The peaceful state of S. has only been broken in the N. by the intrigues of the Zorilla republican party among the inhabitants aggrieved by the abolition of the Fueros (q. v.). In view of the spread of Socialism, all foreign members of the International were ordered to quit S. in December 1878. See Lafuente, *Historia General de España* (30 vols. 1850 *et seq.*); Prescott, *Ferdinand and Isabella* (new ed. 1862), and *Philip II.* (new ed. 1875); Dozy, *Histoire des Musulmans d'Espagne* (4 vols. 1864); Baumgarten, *Neuere Geschichte S.'s* (3 vols. 1867–71); Boehmer, *Bibliotheca* of Spanish Reformers (vol. i. 1874); the Calendar of State Papers relating to S. and England (3 vols. 1862–77); Hare's *Wanderings in S.* (1873); Thieblin's *S. and the Spaniards* (2 vols. Lond. 1874); and the Guide-Books of O'Shea (6th ed. 1878) and Ford (new ed. 1878).

Spal'atin, Georg, born in 1484 at Spalt in Bavaria, was originally named Burckart, but called himself S. from his native place. After studying at Nürnberg, Erfurt, and Wittenberg, he became (1507) pastor at the village of Hohenkirchen near Gotha. In 1512 he was appointed university librarian at Wittenberg, and in 1514 court chaplain and privy secretary at Dresden, in which position he had great political influence as the most trusted counsellor of the Elector. He greatly advanced the cause of the Reformation as 'superintendent' at Altenburg, where he died 16th January 1545. The chief works of S. are his biographies of Friedrich the Wise (new ed. by Neudecker and Preller, Jena 1851) and Johann the Constant, his *Christliche Religionshändel* (published as *Annales Reformationis*, Leip. 1718), his history of the popes and emperors of his time, and his letters. See the biographies of S. by Schlegel (Jena 1693), and Wagener (Altenb. 1830).

Spala'to, the largest and most beautiful town of Dalmatia, Austria, on a peninsula which on one side separates the Bay of S. from an inlet of the Adriatic, partly inclosed by Brazza, Solta, and other islands. It is mainly interesting as the place which Diocletian, the greatest of the Illyrian emperors, chose as his resting-place after the toils of government and warfare, and where he reared 'the vastest and noblest dwelling that ever arose at the bidding of a single man.' Near his own birthplace (Salona) he built this palace, *Salonæ Palatium*, 'which marks a still greater epoch in Roman art than his political changes mark in Roman polity.' The work of twelve years, it is remarkable in art as showing for the first time the true Roman use of columns, and forestalling the long arcades of the Christian basilica. In its wide circuit it included quarters for soldiers and various officials; the walls, towers, and gates were those of a city rather than a palace. After the death of the founder no emperor made it his residence, and while still new it seems to have become a cloth factory where women worked, and which therefore appears in the Notitia as a *gynæcium*. On the overthrow of Salona by the Avars in the 7th c. the inhabitants settled within the walls of the palace, and there grew up the modern city known first as Aspalathon, and subsequently as S. The stateliest parts of the palace still remain; the great open court, the peristyle with its arcades, is the public piazza, and the mausoleum (the so-called Temple of Jupiter) is the Christian *duomo*. S. itself, now desolate, was one of the greatest cities of the Roman world, and 'if it does not rank with Rome, old or new, with Ravenna and with Trier, it is because it never was, like them, an actual seat of empire.' The modern city, the seat of a bishop, has an active trade in grain, cattle, wine, fruit, rosoglis, &c. Pop. (1870) 15,784. See Freeman's *Hist. and Archit. Sketches* (1876).

Spal'ding, a market-town of Lincolnshire, England, on the Welland, 14½ miles S.S.W. of Boston, is an important railway centre. It has a fine Perpendicular church (restored 1860), a sessions-house (1840), Elizabethan corn exchange (1856), butter-market (1857), and a grammar-school founded in 1588. There are bone, flour, and saw mills, breweries and coach-factories, and an extensive trade by rail and river, the latter being navigable for vessels of 60 tons. S. publishes one weekly newspaper, and had a pop. (1871) of 9111.

Spallanza'ni, Lazaro, a famous Italian physicist, was born at Scandiano in Modena, 12th January 1729, studied at Bologna, took holy orders, and in 1755 was made professor of logic, rhetoric, and Greek at Reggio, but continued the study of physical science, and in 1768 obtained the chair of natural history at Pavia. In 1779 he travelled over Switzerland, and in 1785 accompanied the Viennese ambassador to Constantinople, visiting also Corfu and Cyprus. He died at Pavia, 12th February 1799. S. by careful study of the Infusoria defended the doctrine of biogenesis against Needham and Buffon, in his *Saggio di Osservazioni microscopiche concernenti il Sistema della Generazione di Needham e di Buffon* (1776). He greatly added to our knowledge of the circulation of the blood by his *Dissertazione di Fisica Animale e Vegetabile* (1780), replying in 1788 by his *Lettera Apologetica* to some strictures by Hunter. In 1792 appeared his six-volume *Viaggi alle due Sicilie ed al alcune parti dell' Apennino*. S. also enriched the museums of Pavia by the collections he made on his travels. He published upwards of twenty-five works, and his all but universal genius displayed equal power in the treatment of philosophy, languages, law, and natural science. His collected works, edited by Senebier, were published at Paris in 1787, and were included in the Milan *Classics* in 1825–26. Some have also been translated into German and English. See Tourdes, *Notice sur la Vie littéraire de S.* (Par. 1799); Pozzetti, *Elogio Storico di S.* (Parma 1800); and Brera, *Storia della Malattia e Morte di S.* (Pav. 1801).

Span, in ordinary language, means a measure of length taken between the tips of the thumb and middle finger when the hand is stretched its utmost. It averages about 9 inches.

Span'dau, a town and fortress of the first rank in the province of Brandenburg, Prussia, lies at the confluence of the Spree and Havel, 6¾ miles W. of Berlin by rail. It has a gymnasium (1862), the Juliusthurm, an important arsenal, one Catholic and two Evangelical churches, among which the Nikolaikirche is a fine edifice of the 16th c. There are considerable manufactures of cannon, gunpowder, thread, carpets, stockings, and tobacco. S. was walled in 1318, and first fortified in 1577–83. It was occupied by the Swedes in 1631–35, yielded to the French 23d August 1806, and from March 1813 was invested by the Russians, to whom the French garrison capitulated on the 21st April. Pop. (1875) without soldiers (530) and officials (222), 26,888.

Spangles are small, thin, circular plates of shining metal pierced with a hole in the centre to enable them to be attached to theatrical dresses, their chief use. Large S. were formerly employed to adorn horse-trappings.

Span'iel, a variety of the dog, exhibiting many sub-varieties which present marked differences in size and appearance. The common S. has large pendent ears covered with long hair; the texture of the coat is silky and fine. The colour is in general a

mixture of liver and white, but may be entirely white. The S. of old was used in pursuit of game; and one variety, the water-S., is noted for its daring and courage in the water. The King Charles S. is a small species, black and white in colour. The name indicates that the breed was believed to have been originally brought from Spain.

Span'ish Grass. See Esparto and Paper.

Span'ish Lang'uage and Lit'erature. Iberians were the first inhabitants of Hispania (q. v.), after them came the Celts, and from the fusion of both races sprang the Celtiberi. The Iberian language survives in Basque; but the Celtiberi, exposed to Phœnician and Carthaginian influences, at length adopted the speech of their Roman conquerors. To Latin literature Spain gave the famous writers Lucan, Martial, the Senecas, Columella, Silius Italicus, Quintilian, Juvencus (earliest of Christian poets), and Prudentius; but Spanish, like all the Romanic tongues, is a descendant, not of literary, but popular Latin—the *Lingua Romana Rustica.* The Gothic hordes, hastening the downfall of old inflections, replaced them by analytical forms, and in the hybrid idiom thus evolved Teutonic cement repaired the ruined torsos of antiquity. Next Arab conquest threatened to sweep away the Latin language. Alvarus Cordubensis (854) records how Christians acquired Arabic to such an extent that hardly one in a thousand could write a Latin letter; a bishop of Seville found he must render the Scriptures into Arabic; and Arabic is the language of more than 2000 documents in the cathedral archives of Toledo. Only in the Alpine Asturias the Christian remnant cherished its native speech, which with the flood of Christian reconquest spread slowly over the Peninsula again. Long as the strife of Cross and Crescent lasted, so long was the struggle of Aryan and Semitic speech for mastery; and as late as the 13th c. Christian monarchs struck coins with Arabic legends and founded Arabic schools; in the 14th, important documents still bore an Arabic signature. Spanish came forth the conqueror, and of its many dialects—Gallician, Catalan, Asturian, &c.—Castilian, the idiom of dominant Castile, acquired the literary pre-eminence. It is a noble aggregate, 'founded on Roman majesty, buttressed by Gothic force, enriched with Arabian filigree,' retaining the *pingue quiddam* that Cicero noticed, the same *os magna sonaturum* that makes the Don seem wiser than he is. Six-tenths of its vocabulary are of Latin, one-tenth of Teutonic, and one of Arabic origin; grammatically it is still purely Latin, 'the formations and inflections remaining,' says Diez, 'thoroughly Romanesque, more Latin-like even than in Italian.' The language of the entire Peninsula save Portugal and the Basque provinces, Spanish is also spoken with more or less dialectic variation in Cuba, Mexico, the greater part of S. America, &c. The Academia Española issued a Dictionary (6 vols. Madr. 1726-39; 9th ed. 1869) and a Grammar (1771; French ed. Par. 1874); of English-Spanish Dictionaries the best are Velasquez' (Lond. 1873) and Neumann and Baretti's (new ed. 2 vols. Lond. 1874). See the chapters devoted to the language in Clarus' and Ticknor's works, Diez's *Grammatik der Romanischen Sprachen* (4th ed. 3 vols. Bonn, 1876), and his *Etymologisches Wörterbuch der Rom. Spr.* (4th ed. Bonn, 1878).

The earliest Spanish monument of certain date is a dull charter confirmed by Alfonso VII. to the town of Avilès (1145), but to the same heroic age belongs the *Poema del Cid* (q. v.), that primitive epic in which the chivalrous side of the nation's character is mirrored as sharply as its devotional reverse in the three scarce later, also anonymous poems, *El Libro de los tres reyes d'Orient*, *La Vida de Santa Maria Egipciaca*, and *Los tres reyes magos.* The poet first known by name is the priest Gonzalo de Berceo (*circa* 1198-1260), author of 13,000 lines of religious *Prosas*, rightly so called; the creator of genuine prose was Alfonso X. (q. v.), whose *Siete Partidas* (1265), or Castilian code, modelled upon Justinian's, is far superior both to his own Gallician hymns and to the wearisome *Don Alexandre* of a clerkly contemporary, Lorenzo Segura. Don Juan Manuel, Alfonso's nephew (1282-1347), anticipated Boccaccio in *El Conde Lucanor*, a collection of Eastern ensamples; and Juan Ruiz, archpriest of Hita, by metrical apologues, not at all unlike the *Canterbury Tales*, founded the school of burlesque about 1340, the approximate date of a Spanish version of the *Dance of Death.* Much older probably than any *versos de arte mayor* were the ballads or *romanceros*, looked on by Conde as Arabic exotics, but self-proclaimed to be a native growth, come down from the Andalusian bards of Strabo (bk. iii.). In their most perfect cycle, that of the Cid, the scattered fragments of the complete *Poema* may be discerned. From ballads it was but a step to chronicles, the earlier of which are so poetical that the after age of the Sepulvedas restored to them metrical form with often the slightest change. Such were the chronicles of Alfonso X., of Villaizan (1379), and Ayala (q. v.), and such the records by loyal servitors of the deeds of their doughty masters, Pero Nino (1379-1453), Alvaro de Luna (1408-53), and Gonzalvo de Córdova, 'the Great Captain' (q. v.), to which may be added the chronicle of Ruy Gonsalez' embassy to Tamerlane (1403-7). But if the transition from Cid ballads to the prose Chronicle of the Cid was easy, equally so was that from the semi-fabulous Chronicle of Don Roderick to pure romances, like *Amadis* (q. v.), *Palmerin de Gaula*, and all the knight-errant train. These close the 'national' period of Spanish literature, which in the peaceful reign of Juan II. (1407-54) was permeated by Provençal and Italian influences. Enrique, Marques de Villena (1384-1434), wizard and epicure, translated Dante and the *Æneid*, whilst founding guilds of the '*gaya ciencia*;' his squire, Macias el Enamorado, lived, sang, and died a thorough troubadour. Lope de Mendoza, Marques de Santillana (1398-1458), wrote sonnets in the Italian, *serranillas* in the Provençal fashion; and the *Laberynto* of Mena (1412-56) is so far Dantesque that it opens in a wood. The Troubadour mania passed away, leaving behind it the courtly *cancioneros*, with their strange medley of pious and amorous strains; but many circumstances combined to tighten the connection of Spain and Italy—the spiritual dominion of the Papacy, the union of the Two Sicilies to the crown of Aragon, the attraction of Padua's learned halls to Spanish students, and the brief conquest of Rome itself. Eight centuries of Moorish warfare ended, Spain's bolder spirits turned to the unknown West; but in the East her scholars beheld and were entranced by the glory of the Renaissance. Boscan (q. v.) grafted the sonnet firmly upon his country's literature; his pupil Garcilasso (q. v.) added the pastoral eclogue, remarking that 'hardly any one had written in Spanish aught worthy of the trouble;' while for the pastoral romance Spain was indebted to a Portuguese, Jorge de Montemayor (q. v.). To the new school of 'Petrarquistas' belonged Acuña (1510-80), the versifier of Karl V.'s *Cavallero Determinado;* Fernando de Herrera (q. v.), whose pastoral romance *Diana* is spared by the Curate from the flames; and Ponce de Leon (q. v.), creator of the Spanish ode. Its great opponent was Castillejo (?1494-1596), who stuck to the *glosas* and *canciones* of the preceding mode; its ablest advocate, Hurtado de Mendoza (q. v.), master of two most opposite forms of composition, the 'picaresque' novel and dignified Sallustian annals. Of history Mendoza shares the honours with Oviedo (q. v.), Avila y Zuniga (q. v.), Las Casas (q. v.), Mariana (q. v.), Antonio de Herrera (q. v.), Garcilasso (q. v.), the brothers Lupercio and Bartolommeo Argensola (q. v.), and Antonio de Solis (q. v.); his *Lazarillo* (1553) gave birth to the *Guzman de Alfarache* (1599) of Mateo Aleman, and the *Gran Tacaño* (1627) of the great satirist Quevedo (q. v.), as these in turn to Scarron's *Roman Comique*, Le Sage's *Gil Blas*, and De Foe's, Fielding's, and Smollett's heroes. While, however, the *gusto picaresco* exerted a widespread influence on foreign writers, at home the works of chivalry, though government prohibited 'such shameful books' (1553), remained the only popular and fashionable reading till Cervantes (q. v.) dealt them their deathblow by his *Don Quixote* (1605), and gave to the world one of the world's few books. Yet, strange as it now may seem, Cervantes had a rival who far surpassed him in contemporary fame, the dramatist Lope de Vega (q. v.). Of the Drama (q. v.), developed in Spain as in other countries from medieval mysteries, our earliest specimens date from about 1472—the satire *Mingo Revulgo* and Royas' *Celestina*, a libertine prose tragi-comedy, or rather dramatised romance, not meant for representation, which, always immensely popular, has been the source of numberless later plays. The eleven 'eclogues'—six quasi-religious, five wholly secular—of Juan de la Enzina (1468-1534), regarded commonly as founder of the Castilian theatre, are rude and slight, but served as models to the Portuguese, Gil de Vicente (q. v.), who in his turn reacted powerfully upon the Spanish stage. A popular vein, first struck by the Seville gold-beater, Lope de Rueda (*flo.* 1544-67), whose comedies Ticknor compares to *Ralph Royster Doyster* and *Gammer Gurton's Needle*, was followed up by Cisneros, Alonso de la Vega, and Timoneda with high success. In vain the erudite

party strove to erect Spain's theatre on classic lines; not even Cervantes' Æschylean *Numantia* achieved the task. But Lope, the reputed author of 21,000,000 verses, wisely discarded unities for human interests, and wrote as a man for men, for Spanish men, one cause why his works are caviare beyond the Pyrenees. Calderon (q. v.), his only equal in the dramatic realm, less easy, natural, and realistic than Lope, was loftier and more refined than he: with Calderon the curtain fell. Of other playwrights —and their name is legion—need only be mentioned Guillen de Castro (1567–1631), from whose *Mocedades* Corneille borrowed his *Cid*; Gabriel Tellez (1585–1642), the hero of whose *Burlador de Sevilla* is the earliest distinct 'Don Juan' (q. v.); Montalvan (1602–38), Moreto (1603–69), and Solis. No Spanish epic has equalled or even approached the first—the *Cid*. The fragment *La Araucana* (1569) of Ercilla (q. v.) has the grand defect that it 'wants a hero,' and hardly justifies its author's title of the 'Castilian Homer' except in being a third as long as Homer's *Iliad*. Voltaire indeed praised, but then he had never read, the poem. The nation's pride more than the nation's genius inspired the *Caroleas*, *Austriadas*, *Lepantos*, and other countless 'epics' of the Blackmore type; 'four thousand poets,' said Lope, 'stand at each turning of the street.' And the religious narratives of Virues (1588), Bravo (1604), and Balbuena (1624), though best of their weary kind, are solely valuable as records of a fanatical faith, whose 'acts' were indeed a shining light. The land of the Inquisition has no Copernicus or Galileo, no Bacon or Descartes. Mystics there are in shoals, Avila (1500–69), Santa Teresa (q. v.), Ribadeneira (1527–1611), Molina (1535–1601), Suares (q. v.), &c., but no philosophers. Spain's *alma mater*, Salamanca, declared as late as 1771: 'Newton teaches us nothing that could make a good logician or metaphysician; Gassendi and Descartes do not agree so well with revealed truth as Aristotle.' In lyric poetry Gongora (q. v.) has at least the merit of inventing the vile *cultismo* known by his name, where tinsel conceits and euphuistic phrases are meant to conceal the poverty of thought; with the accession of the Bourbons (1701) invention of any sort came to an end. The Castilian muse changed her mantilla for Parisian modes, her dignified native speech for mincing Gallicisms. Amongst French copyists and translators the best, *i.e.*, most servile, are perhaps Ignacio de Luzan (1702–54), Velasques de Valdeflores (1722–72), Siscar and Amirola (both about 1750), and Moratin (q. v.). Far easier is it to enumerate the few opponents of these *Afrencesados*—Huerta (q. v.) and Hartzenbusch (q. v.), would-be revivers of a national stage; the Padre Isla (1703–81), who once more essayed the picaresque novel, in *Fray Gerundio* assailed the monks, and translating *Gil Blas* into Spanish, claimed it for Spain; and Melendez Valdez (1754–1817), Cervantes' follower at a distance. In 1790 the final volume appeared of a work that had exercised a singular influence on Spanish literature, the *Index Expurgatorius*; eighteen years later the French abolished the Inquisition. But with the Restoration it was again established, and the state of letters was worse than ever before. Imprisonment, death, or exile rewarded Quintana (q. v.), Valdes, Rosa, Moratin, nearly all Spain's authors—they were not many! That time of tyranny is past, its effects remain. The death (1877) of 'Fernan Caballero' (q. v.) has removed the one Spanish writer whom Europe knows. Of the Romanticists of 1830, from whom great things were hoped, Zorilla (born 1817) alone remains, and even his works are far less popular than the trivial *vers-de-société* of Grillo, Palacio's sonnets, and Querol's *rimas*, all copied from the French. Becquer (died 1871) and Ferrant, by way of change, have imitated Heine with some success; Campoamor, to quote a Spaniard, is 'one of Spain's few original writers.' The historians La Fuente, Arrangoiz, and Muro, antiquated in thought, have lost the old knack of prose; Gonzales, Valera, and Galdós look upon Dumas as the ideal novelist. At least it is comforting to find that on the stage Lope and Calderon still hold their own, and have been imitated not quite in vain by Zarate (born 1796), Breton de los Herreras (1796–1873), and other dramatists. See Bouterwek's *Geschichte der Spanischen Poesie und Beredsamkeit* (Gott. 1819); Sismondi's *Littérature du midi de l'Europe* (Par. 1819); Clarus, *Darstellung der Spanischen Literatur im Mittelalter* (2 vols. Mainz. 1846); Ticknor's *History of Spanish Literature* (3 vols. Lond. 1849; new ed. 1871), the standard work; Schack's *Geschichte der dramatischen Literatur und Kunst in Spanien* (2d ed. Frankf. 1854); Amador de los Rios' *Historia Critica de la Literatura Española* (2 vols. Madr. 1861–62); Mila's *Poesia heroico popular en Castilla* (Bar. 1872); and Hubbard's *Histoire de la Littérature contemporaine en Espagne* (Par. 1876).

Span'ish Main, a name commonly given in the 16th and 17th centuries to the mainland of S. America from the Isthmus of Darien to the mouth of the Orinoco.

Span'ish Town, the name of two towns in the W. Indies: (1) The former capital of Jamaica, on the Cobre, 10 miles W. of Kingston, a poorly-built place with a pop. of 7000. (2) The capital of Trinidad, has several hospitals and asylums and a good harbour. Pop. 13,000.

Spank'er (from vulg. *spank*, 'to move quickly'), the after-sail of a ship or barque, is a fore-and-aft sail attached to a gaff.

Spar, a term applied by mineralogists to a variety of minerals, Iceland S., fluor S., heavy S., &c., which seem to have little in common save their perfect crystalline character. The name is used by miners to designate any crystalline mineral.

Spar'idæ, a family of Teleostean fishes, belonging to the *Acanthopterous* section, and allied to the *Mullidæ* or mullets. The S. have long, compressed bodies, an unarmed tail, and from 5 to 7 branchiostegal rays. The teeth form a cutting series in front or prominent grinders to the back. There is one dorsal fin. The anal is 3-spined, and the ventral fins are on the chest. The Braize, Sea Bream, and Gilthead are typical representatives.

Sparks, Jared, an American biographer and historian, was born at Willington, Connecticut, on May 10, 1789. After studying at Harvard, where he was for some time mathematical tutor, he became pastor of a Unitarian church in Baltimore in 1819, and two years afterwards was chosen chaplain to the United States House of Representatives. In 1823 he retired from the church and settled at Boston, purchasing the *North American Review*, of which he was sole editor until 1830. S. had previously edited a Unitarian magazine and published numerous works of controversial theology. He now devoted himself to historical and biographical studies, visiting Europe in 1828 to make researches. In 1830 he founded the *American Almanac*. From 1839 to 1849 he was professor of history at Harvard, and from 1849 to 1853 president of the college. He died at Cambridge, Massachusetts, March 14, 1866. His principal works are a *Life of John Ledyard* (1828); *The Diplomatic Correspondence of the American Revolution* (12 vols. Bost. 1829–30); an edition of *The Writings of George Washington, with a Life of the Author* (1834–37); a *Life of Gouverneur Morris* (1832); and an edition of *The Works of Benjamin Franklin, with a Life of the Author* (1836–40). He also edited two series of *American Biography* (1834–38, 1844–48). See Ellis's *Memoir of J. S.* (1869).

Sparr'ow (*Passer*), a well-known genus and species of *Insessorial* birds, belonging to the family *Fringillidæ*, and to the *Conirostral* section of the order. The bill is broad at the base, and has its tip slightly hollowed. The second and third quills are the longest, and the tail is of moderate size. The colour of the common S. (*P. domesticus*) is grey on the top of the head and brown on the back, each feather having a black centre. The under parts are grey inclining to brown. The average length is 5 inches. The eggs, numbering 5 or 6, are of a dull white hue spotted with brown, and several broods may be produced in one year. The Hedge S. (q. v.) is an entirely different bird from the common S. The Tree S. (*P. montanus*), on the other hand, is allied to the common S. Its head is of chestnut colour, and there is a black triangular patch on each cheek, the under parts being brownish white. The nest is built in trees. The White-Throated S. of America is the *Zonotrichia albicollis* of ornithologists. It is a handsome bird, attaining a length of 6 inches, and inhabits the S. States of America. The head is striped white and black, the chin, breast, and belly are white, and the upper parts are a varying brown and black.

Sparr'ow-Hawk (*Accipiter nisus*), a species of Raptores (q. v.), belonging to a special sub-family (*Accipitrinæ*), in which the bill is strong and sharply arched, and the tarsi covered in front with scales of large size. The S.-H. attains a length of 12 inches. It is one of the commonest of hawks, and is represented in America by the *A. sparverius*. The S.-H. is dark brown above, and reddish brown below. The brown is varie-

gated with dark tints, and the tail and wing-coverts are barred with black. The plumage of the female, which is larger than the male, is diversified with white spots. The eggs are 3 or 4 in number, and are of a dirty white, marked with brown. The S.-H. is a bold active bird, frequently attacking other species of larger size than itself with success.

Spar'ta, called also Lacedæmon, the chief city of Laconia, and head of the Dorian confederation while the latter held the hegemony of Greece, was situated on the right bank of the Eurotas, at the foot of the mountain-ranges of Taÿgetus and Parnon. Owing to its impregnable situation S. was never fortified during the autonomy of Greece, the tyrant Nabis (B.C. 195) having been the first to build walls round it; and the houses of its inhabitants were for the most part small, lying snugly in the midst of gardens, and even the temple and state buildings were on a much less magnificent scale than those at Athens. The city lay partly on two low hills forming the southernmost spur of Taÿgetus, about 10 stadia below the junction of the Eurotas and Ornus, and partly on the fertile plain stretching S. from them along the course of the river. There is some doubt which of these hills formed the Acropolis, but Curtius is probably right in selecting that nearer the river, on the S.W. side of which also the theatre was excavated. The chief building on the Acropolis was the temple of Athene Chalciœcus, so called because covered by the architect Gitiadas with plates of bronze; below which to the E. was the Agora, containing the various public buildings, and especially the Persian Stoa built from the spoils obtained in the Persian wars, and adorned with figures of Persians in white marble upon the columns. S. beheld an enemy for the first time in B.C. 369, when Epaminondas invaded the Peloponnesus after the battle of Leuctra, and in B.C. 195 it was taken by the Romans under Flamininus. A small village called New Sparta is now built on the heights to the E. of the ancient city. In historical times the population of S. consisted of three elements; the Spartans proper, or governing class, descended from the original Dorian conquerors; the Periœci, the subject race who cultivated the land and carried on such trade as the principles of the state allowed, but though personally free had no political rights; and the Helots or slaves. The government, though nominally democratic, was really a close oligarchy, the popular assembly having no true power in the state, and even the kings having to submit to the dictates of the Ephors (q. v.). Still, in accordance with the laws of Lycurgus (q. v.), to the very end of Sparta's freedom, the whole machinery of a popular government was kept up, with the two Heracleid kings at its head. From their earliest youth the Spartans were brought up under strict military discipline, dining together at the public table (*syssition*), and utterly forbidden to take part in anything but military or predatory exploits. By this means they became the most perfect foot-soldiers Greece ever saw, but altogether destitute of refinement or liberal sentiment. The history of S. has been given under Hellas (q. v.); subsequent to the Dorian invasion—previous to which the names of Menelaus and Helen connect it with the Trojan War—it divides itself naturally into six periods, according to the various enemies against whom S. was contending, the Dorian, Persian, Athenian, Theban, Macedonian, and Roman. The first three S. conquered; to the last three she had to submit. On the topography of S. the best ancient authority is Pausanias (q. v.), among moderns Curtius' *Peloponnesus* (2 vols. 1852) is invaluable. For the history, besides the general works of Thirlwall, Grote, and Curtius, Müller's *Dorians* (2d ed. 2 vols. 1844) may be consulted. S. never having been destroyed, it is anticipated that research in the deep soil will bring to light many remains. Remarkable reliefs have been discovered within the last few years; *e.g.*, the relief-bearing four-sided pedestal, and the separate relief of Dionysos and Ariadne.

Spar'tacus, a shepherd of Thrace, who became a Roman auxiliary, but deserted as a bandit. Captured and sent to the training-school for gladiators at Capua, he persuaded seventy-four others to join him in attempting freedom (B.C. 73). They fought their way through the streets of the town, and escaped to the crater of Vesuvius, where many other slaves joined them. Led by S. and two Gauls—Crixus and Œnomaus—they plundered surrounding towns. C. Claudius Pulcher, with 3000 men, was sent to blockade them, but escaping, they fell on his rear and defeated him. S. now proclaimed freedom for all slaves, and hordes joined him. With an army of 70,000 he defeated Corsinus and the prætor Varinius Glaber. But seeing that numbers were demoralising his ranks, he proposed to force the Alpine passes and escape home. His troops, flushed with success, refused, and the war went on. In 72 he repeatedly defeated two consular armies operating against him in N. Italy, but retired south in winter. Pushing north next spring, he routed C. Cassius, Cn. Manlius, and Mummius, legates of Crassus, who now (71) as prætor had the conduct of the war. Crassus' energy was seconded by frequent desertion from S., whose diminished army was blockaded in Rhegium. Failing to cross to Sicily, S. faced round, forced the Roman lines after a bloody struggle, and marched on Rome. Suddenly his Gallic contingent, 30,000 strong, deserted. Thus weakened, he again strove to lead his army N., but they madly refused, and the final struggle took place soon after near the source of the Silarus. S. foreknew the certain issue. Stabbing his horse, he rushed into the thickest of the combat, fought with desperate valour, and fell 'like a free man and a brave soldier.' S. was the mightiest of guerilla captains. Resource, perseverance, prudence, clemency, and courage—such were the qualities which would have made him triumph had success been possible. See Mommsen's *Röm. Gesch.* (Eng. trans. 1864–66).

Spar'tel, Cape, the N.W. extremity of Africa, at the Atlantic entrance to the Strait of Gibraltar. It is a bold headland, with a range of basaltic columns like the Giant's Causeway (q. v).

Spasms (Gr. *spasmata* from *spaō*, 'I draw out'), are irregular and violent contractions of the muscular structures, but less violent than convulsions. S. are always involuntary, even when the voluntary muscles are concerned. There are two varieties of S., called tonic and clonic. *Tonic* S. (from Gr. *tonos*, a 'bracing up'), or *spastic contractions*, consist in contractions attended with rigidity or hardness of the muscles, as in common *cramps* and *tetanus*. *Clonic* S. (from Gr. *klonos*, an 'agitation') consist in rapidly alternating contraction and relaxation, as in *chorea*, *epilepsy*, and *convulsive hysteria*. S. constitute the more important symptoms in several diseases, as in spasmodic croup, and certain forms of retention of urine.

Medicines which are prescribed to allay irregular and inordinate muscular contractions or S., called antispasmodics, are the following:—Hydrocyanic acid, ether, ammonia, assafœtida, belladonna, cajuput, camphor, cannabis indica, castoreum, chloral hydrate, chloroform, conium, galbanum, hyoscyamus, lobelia, moschus, oils of peppermint and ruta, stramonium, sumbul, turpentine, valerian, and oxide of zinc.

Spathe or **Spath'a**, in botany, means a large bract or floral leaf enveloping the immature inflorescence of some monocotyledons, and so guarding it from injury. The enclosed inflorescence often consists of an axis bearing numerous closely-packed sessile flowers, arranged in a spike-like manner—this is termed a *spadix*. The genus *Arum* offers a good example of S. and spadix. In palms the spadix is frequently branched, the branches being subtended by secondary spathes.

Spa'vin, a disease affecting the ankle or hock-joint of the horse. In young horses of weakly constitution, which have been overworked, the joint inflames, and the synovial secretion is present in increased quantity, and is dark-coloured. This variety of the disease known as 'log,' or 'blood S.,' is treated by rest, wet bandaging, and aperients. The other form of the disease consists of a bony deposit in the joint, and is hence named 'bony S.' When the case is mild, it is treated by rest, fomentations, and blistering; but when aggravated it is hardly curable.

Spawn'ing of Fishes. In all Vertebrates the sexes are distinct, but impregnation in fishes is, as a rule, effected externally to the body of the female. In some fishes (*e.g.*, sharks) the male is provided with a pair of organs named claspers, and by means of these the male adheres to the female during the act of fecundation. Most fishes spawn by simply depositing their eggs, the male shedding the milt upon them. In some, *e.g.*, the blennies, the young are retained within the parent body until they are ready to swim. Impregnation in this case must be internal. The writer has removed over 100 young in a well-developed state from the abdominal cavity of a viviparous blenny. The eggs in some species (*e.g.*, dogfishes, rays, &c.) are enclosed in tough capsules named 'mermaids' purses.' The number of eggs produced is in some cases enormous: a single codfish has been known to produce over 3,000,000 eggs. The flounder and salmon are also exceedingly prolific.

Speak'er. See PARLIAMENT.

Speak'ing-Trumpet is a portable conical tube of metal or guttapercha with one end flaring, employed principally at sea to reinforce the sound of the human voice so that it may be heard at a great distance. According to Chappell (see *Nature*, November 7, 1878), who has noted two examples among the plates of Lepsius' work on ancient Egypt, the S.-T. is as old as the Pyramids; and one is said to have been used by Alexander the Great, 335 B.C. Saland constructed one in 1652 from a description by Athanasius Kircher, a Jesuit; but the first who philosophically explained it and brought it into notice was Sir Samuel Morland, master of mechanics to Charles II., who in 1670 constructed one of glass, a second of brass, and a third of copper. The last, which gave the best results, was recurved, 16 feet 8 inches long, 19 inches in diameter at flaring end, and 2 inches at lip-piece, and words spoken through it were audible at 1½ miles distance. Several instruments deriving their power from electricity have lately been devised for enabling vocal or other sounds to be heard at great distances. The inventions are yet in their infancy, but they are full of promise of great practical usefulness.

Spear, a weapon consisting of a sharp-pointed blade mounted on a long wooden shaft. Its use dates from a very remote period, and at the present time it continues the principal *missile* of many savage tribes. See LANCE and PIKE.

Spe'cial Ju'ries are juries of men of education presumably above an average, and who are therefore supposed to be specially qualified to judge in difficult questions. By the Jury Act, every man described in the jurors' book as an *esquire*, or person of high degree, or as a banker or merchant, is qualified to serve on a special jury. Special jurors may receive such payment, not exceeding one guinea, as the judge thinks reasonable. The same jury may, by consent of parties, try any number of cases.

Spe'cial Li'cense. In England a priest may lawfully perform marriage rites without publication of banns, by S. L. from an archbishop. S. L. also authorises a change from ordinary time and place. The stamp-duty is £5. See MARRIAGE.

Spe'cialty Debt. See DEBT.

Spe'cies, a term employed in biology to denote all those individual animals or plants, which from the persistence of similar characters might be presumed to be related together in the nearest ties of blood relationship, and as such to be fertile, *inter se*. As examples take the two known S. of elephants (African and Indian), or camels (dromedary and Bactrian). Each elephant reproduces its like; the progeny of the Indian invariably resembles all other Indian elephants, and of the African S. the same holds good. In no case do we find an Indian elephant producing the large ears, larger body, and other peculiarities of the African. Nor do we find a dromedary giving origin to a two-humped Bactrian camel. Hence this apparently well-founded characteristic, of each 'kind' of animal giving birth to progeny like itself, has always constituted the leading idea in the definition of a S. But for this transmitted likeness, the S. of animals or plants could never have continued in a stable form. Such an idea forms the basis of the definition of S. which in former biological periods were frequently constructed. By Rhymer Jones a S. is defined to be 'a number of animals, so closely resembling each other that they all might be supposed to be the offspring of the same parents, and in turn to give birth to progeny exactly resembling themselves.' By Buffon, S. was defined 'as a constant succession of individuals, similar to and capable of reproducing each other.' De Candolle affirmed a S. to be 'a collection of individuals resembling each other more than they do others, and able to produce their like; doing so by the ordinary process of generation, and so as to form grounds for belief that they originally descended from a single pair.' Woodward's definition is that a S. is formed by 'all the specimens or individuals, which are so much alike that we may reasonably believe them to have descended from a common stock.' Pritchard remarks of a S., that it is constituted by 'separate origin and distinctness of race, evinced by a constant transmission of some characteristic peculiarity of organisation.'

Such were the ideas that prevailed until a comparatively recent period. But a great change has taken place in our conceptions of S. since the publication of the theories of 'evolution' and 'transmutation,' associated with the names of Lamarck, Darwin, and Wallace. The old theory of the *special creation of animals and plants* necessarily assumed that each S. had descended from a primitive pair, and that the specific likeness originally stamped by the creative fiat upon the organism was capable of transmission and perpetuation throughout all time. Thus the rigidity and stability of S. was regarded as a corollary to the idea of their special creation. The progress of research showed, however, that a process of *variation* is continually represented, in greater or less degree, in all S. of living beings. No S. is free from variation, induced sometimes by causes capable of determination (such as change of food, climate, &c.), and often by causes of whose nature and extent we are absolutely ignorant. No fact is better established than that of *specific variation*, which may be regarded as the keynote of every theory of 'transmutation' or 'evolution.' As examples of variation produced by known causes, the various breeds of domestic animals may be instanced. It is an equally interesting fact, that in not a few S. of animals and plants there are two or three normally different and distinct genera included in one and the same S. Many butterflies exhibit this peculiarity, the female insects appearing normally in two or three distinctly different forms; many plants (*e.g.*, primrose) possess two different variations of arrangement of the flower-parts; and regarding some groups of plants, and notably the willows and brambles, no two botanists can agree upon which are to be regarded as *S.* and which as mere *varieties*.

The test of the rigidity and stability of a S., derived from the fact that individuals of different S. (*e.g.*, horse and ass) are sterile when crossed, or that their progeny (*e.g.*, the mule) at least is barren, is not satisfactory. Although some S. are barren when crossed, and others produce sterile progeny, this distinction is far from absolute; and in the case of some lower plants it has been proved that there are certain organisms which are more fertile if impregnated by a different S. than when fecundated by their own kind. Admitting the operation of the law of variation—the exact sway and boundaries of this law being as yet undetermined—naturalists have very generally given in their adherence to the idea that such variation implies a new relationship between S.; that animals and plants, instead of being the descendants of primitive pairs, may, as Darwin maintains, 'undergo modification,' and that 'the existing forms of life are the descendants by true generation of pre-existing forms.' Mr. Darwin and Mr. Wallace lay stress on the operation of *natural selection* in producing new S. According to this hypothesis S. are thus modified:—1. Every S. is subject to variations from, and modification of, the parent-type. 2. Variations are transmitted to offspring by heredity. 3. A selection of characters on the part of the parents (as in the case of sheep and cattle breeding) produces definite and known combinations of characters in the offspring, and varieties differing widely from the parents are thus produced. 4. External or physical conditions also undergo change, and favour variations through fluctuations of climate, food, land-surfaces, &c. 5. More young are produced by the S. of animals and plants than can possibly be preserved. 6. This excessive population is weeded out by nature; the weakest go to the wall; the strongest are those which *vary* from the type of the species. 7. Hence nature 'selects' varying individuals, and offers a premium in favour of producing further variation by inheritance. 8. Through the succession of varieties, new S. differing widely from the old are in time produced.

Many subsidiary causes, as Darwin shows, are brought into play in the evolution of new S. by 'natural selection.' The difficulty of supplying 'missing links,' *i.e.*, the transitional or intermediate forms between existing S., is due in greater part to what has been so succinctly named 'the imperfection of the geological record.' But in a few cases the gaps in this record have been supplied; *e.g.*, in the case of the horses where every gradation may be traced backwards in time, from the present existing one-toed horses to the four or five toed ancestors from which they have been derived. So also is it with the gaps between birds and reptiles which have been well-nigh filled up; and so with the Crocodilia, whose modifications from the Triassic period to the present day have been fully traced. See Darwin's *Origin of S.* (Lond. 1859) and *Animals and Plants under Domestication* (Lond. 1867; new ed. 1876); Wallace's *Contributions to the Theory of Natural Selection* (Lond. 1870).

Specif'ic Grav'ity of a substance is defined as the ratio of the mass of any given volume of the substance to the mass of an equal volume of some standard substance—usually water in the case of solids and liquids, or hydrogen or atmospheric air in the case of vapours and gases. To find this ratio experimentally for a solid substance, all that is necessary is to weigh it in air and in water, take the difference between the true mass as given by the former operation and the apparent mass as given by the latter, and finally divide the true mass by this difference, which, in accordance with hydrodynamic laws, is the measure of the mass of the volume of water equal to the volume of the substance under investigation. This ratio is the S. G. To find that of any liquid, it is sufficient to weigh in it a solid whose real mass and whose apparent mass in water are already known. The differences between the real mass and the two apparent masses are the measures of the masses of equal volumes of the given liquid and of water, and their ratio gives the required S. G. In these methods no account is usually taken of the mass of the air; but for purposes of great delicacy it is requisite to allow for this. The term 'S. G.' is a bad one—since the conception has nothing whatever to do with the force of gravity, which enters in only indirectly as affording the best means for determining the various measures of mass. It is really the ratio of the densities, and is therefore the measure of the density if the density of the standard substance is taken as unity.

Specif'ic Perform'ance. A court of law may order S. P. of a contract; that is, that the condition of the contract be carried out; but usually, in an action for breach of contract, if the plaintiff gain he is awarded money.

Spec'tacles are optical instruments for correcting defective sight. They consist of two oval or circular lenses of glass or rock-crystal ('pebble'), mounted in a light metal frame which is made up of the 'bows,' 'bridge,' and 'sides' or 'temples.' Steel of a blue or straw-colour, or gold, is now principally used for the frame; formerly tortoise-shell and silver were much in vogue. The frames of 'eye-glasses,' single or double, are still frequently made of tortoise-shell or horn. The most common lenses for S. are the *bi-convex* and *bi-concave*, which are employed to assist far-sight and short-sight respectively. Convex lenses remedy the defect of the eyes having too weak refracting power on the rays of light, while concave lenses counteract an excessive refracting power. Care should be exercised in the choice of S. to select such as have the least strength that answers each individual case, as the use of too powerful lenses tends to intensify the imperfection it is desired to remove. When imperfect eyes have not the same refracting power, S. with lenses of different focal length ought to be used. In 'divided S.' each lens is composed of two semicircles of different foci neatly united. *Periscopic* S., having menisci, or concavo-convex lenses, were designed by Dr. Wollaston to facilitate oblique vision. Green and blue-tinted S. are used to protect the eyes from a glare of light. S. were unknown to the nations of antiquity; yet, singular to say, they seem to have had some acquaintance with lenses. A plano-convex glass lens, focal length 4½ inches, was discovered at Nineveh by Layard, who believes it was employed as a magnifier for reading or in gem-engraving. Another convex lens was found at Pompeii in 1854, and is now in the Naples museum, but King (*Antique Gems and Rings*) gives it as his opinion that it is only a paste imitation of peridot, which was destined by a gem-engraver to receive an impression. It is said that Nero, being short-sighted, used a concave emerald, which was set open in a ring, to view the combats in the arena. S. are believed to have been known in China at a remote period; and their invention in Europe is ascribed, among others, to Alessandro de Spina, of Florence, about 1285 A.D. Roger Bacon, who died in 1292, alludes distinctly to them, and they were assuredly not uncommon in England in the 15th c.

Spec'tre Bat, the popular name of a species of bat belonging to the genus *Phyllostoma*. The nose has leaf-like appendages, which give the face a peculiar and weird appearance. The S. B. inhabits S. America.

Spec'trum Anal'ysis, a powerful and delicate method of distinguishing different kinds of matter by their properties in relation to light. When Newton, in his darkened chamber, extended the circular beam of white sunlight into the long strip of rainbow tints by refraction through a prism, he struck upon a totally new path, which within the last half-century has led us to the discovery of some of the grandest truths of cosmic science. His experiment demonstrated that different coloured rays of light had different refrangibilities, that white light consisted of a complete series of these coloured rays which when refracted formed a continuous spectrum or strip of colours passing by imperceptible gradations from red, the least refrangible, through yellow and green to violet, the most refrangible. By substituting for Newton's circular aperture a narrow slit through which the sunlight streamed, Wollaston in 1802 obtained a purer spectrum, freer from the overlapping of the different coloured images which was inevitable in Newton's original form of experiment. The spectrum thus improved was found to be no longer *continuous*, but to be crossed by a number of dark bands, each of which obviously indicated the absence or at least the relatively weaker intensity of the ray of corresponding colour and refrangibility. At the time Wollaston made his discovery very little attention was paid to it even by himself, and not till these lines were re-discovered, mapped, and named by Fraunhofer in 1814, did they become known to the scientific world at large. Accordingly, they are not infrequently called Fraunhofer's Lines. One of the most remarkable of these is the double line D, which appears double when viewed by superior instruments, and which lies in the boundary between the orange and the yellow of the spectrum. Now, Fraunhofer further discovered that when he viewed the spectrum of the flame of an ordinary tallow candle there appeared a pair of bright lines which, as far as his instruments enabled him to make out, occupied exactly the same position in the flame spectrum as the double D did in the solar spectrum. In other words, the candle-light had in excess one of the component rays in which the sunlight was wholly wanting. This exact coincidence was tested and verified by Professor Miller of Cambridge in 1849; and Professor Swan of St. Andrews had meanwhile shown the bright lines in the flame spectrum to be due to common salt, which pervades the air everywhere. Reasoning from these two facts, Stokes concluded that sodium vapour existed in the sun's atmosphere. The nature of his reasoning is best shown by his own analogy from the branch of physics which treats of sound. It is known by experiment that if a musical note is sounded in the neighbourhood of a tuning-fork or stretched cord which is tuned to that note, the fork or cord will take up the note and continue to sound it, even after the original note has been made to cease. Imagine then a room filled with pianoforte wires all tuned to exactly the same note—say, the treble C. A listener at one side of the room will hear any note sounded at the other side with intensity as strong or nearly so as if there were no obstacle in the way, *provided that note be not C*. If, however, the note sounded is C, then the wires will all take up the same note, a loss of energy inevitably ensue, and the sound be possibly completely frittered away in lost vibrations, so that the listener hears nothing. In any case the sound would be sensibly diminished, and thus the pianoforte wires act as an absorbing medium to that note, and only that note, to which they are tuned, and which they can give. In exactly a similar way, the molecules of glowing sodium vapour, which by their vibrations give forth rays of light of definite refrangibility and colour, absorb those particular rays when they are directed through the heated gas from some external source. The same curious phenomena of absorption which led Stokes about 1850 to his conclusion had also been observed by Foucault; and in 1853, the Swedish physicist Angström stated that an incandescent gas radiates light of the same refrangibility as that which it absorbs. Simultaneously, then, these three made the same great discovery, but Stokes alone applied it to solar physics. Sir William Thomson, deriving his knowledge directly from Stokes himself, regularly stated from 1852 onwards in his lectures to his Glasgow students that sodium vapour existed in the sun, and that to find the other constituents of solar and stellar atmospheres was simply a question of comparison of the line spectra of known substances with the absorption lines of the solar spectrum. Not till six or seven years later, however, did this grand truth become generally known, when other physicists, following in the same path, made the same discoveries. In 1858, Balfour Stewart extended Prevost's old law of the Theory of Exchanges, which Leslie and others had more recently developed, demonstrating that not only is a good radiator a good absorber, but that there is absolute equality between the radiating and absorbing powers of a substance for every definite ray. In 1859, Kirchhoff, working independently, came to the same theoretical

conclusion, that in all bodies the measure of the absorbing power for a particular ray is the measure of the radiating power for that ray. Hence a substance which under given conditions radiates only a few rays, as in general glowing gases do, can under the same conditions absorb only these rays. Carrying his experiments to sunlight, Kirchhoff introduced a new absorption line into the solar spectrum, by passing the ray through incandescent lithium vapour, which gives a very distinct red line in its spectrum. With this red line the new absorption line exactly corresponded. By gradually weakening the sunlight, the lithium absorption line appeared to grow brighter, till it was of the same intensity as the rest of the spectrum when it disappeared. A further diminution of solar light made the line to come out brighter than the darker background. In this and other ways he experimentally proved that absorption lines exist only when the incandescent source is at a higher temperature than the absorbing vapour. Such is the brief history of the birth of S. A., which under the fostering care of Bunsen, Huggins, Lockyer, Draper, Jannsen, and a host of others, has led to a knowledge of the composition of the sun, stars, nebulæ, and comets, to an estimation of the velocities of the stars relatively to our sun, to the discovery of new elements, and to a deeper insight into the molecular structure of bodies. Quite recently Lockyer, from certain modifications in the spectra of calcium and similar 'elements,' gives reason for believing them to be true compounds. In the preceding sketch only the sure steps of progress are given. Many facts which have an important bearing on the theory were discovered years before S. A. was developed.

A *continuous* spectrum, made up of all possible rays from red to violet, can be emitted only by bodies which absorb all rays, and must therefore belong to some dark or opaque body, intensely self-luminous. Such spectra are emitted by glowing solids or liquids, or highly compressed gases. Gases, under ordinary circumstances, have discontinuous spectra composed of bright lines or bands at definite intervals from each other; but by forcibly compressing these gases, the lines may be made to broaden out into bands, and the bands into broader bands until they meet and form an unbroken line. The explanation of this is, that the molecules of the gas when it is giving a line spectrum vibrate freely according to their peculiar law, and, transmitting these vibrations to the ether, radiate light of definite wave length, refrangibility, and colour. By compression the molecules are brought closer together, and no longer execute the simple vibrations they formerly did, until at length, when the gas is sufficiently condensed, the molecules are capable of throwing off rays of every wave-length, as the vibrating molecules of solids do. The bearing of these remarks upon the physical constitution of bodies which are far beyond our reach is noticed under the special headings, such as COMETS, NEBULÆ, STARS, SUN, &c.; and in the article STARS the nature of the reasoning by which we pass from the spectrum to a knowledge of the velocity with which a star is approaching or receding from us will be touched upon. Throughout the article it has been taken for granted that the spectrum is obtained by refraction through a prism or series of prisms; and such an apparatus, with telescope attached for viewing the rays as they emerge, is called a *spectroscope*. The greater the number of prisms, the greater is the dispersion, and the more widely separated will two contiguous lines appear; but a great loss of light necessarily accompanies the multiplication of prisms. Instead of a prism a diffraction-grating may be used (see DIFFRACTION), and this latter method gives a purer and more complete spectrum, since absorption of light by the glass is inevitable in the former case. It must be remembered that the spectrum is not limited to what we see. Below the red rays are the dark invisible heat-rays, while above the violet exist the actinic rays which are effectual in photography. The latter may be rendered visible by throwing them upon a surface which has been wetted with solution of quinine or other fluorescent substance (see FLUORESCENCE). The active rays are degraded to rays of a neutral violet tint; and in the solar spectrum, absorption lines are thus shown to exist among those rays of higher refrangibility which are too fine for our organs of vision to see directly. The chief books upon the subject are Schellen's *Spektralanalyse*, Roscoe's *S. A.*, and Lockyer's *The Spectroscope and its Applications*, and *Solar Physics*. No modern treatise upon the sun or astronomy in general can be complete without an account of the development of this branch of physics; and in Tait's *Recent Advances in Physical Science* will be found a thorough inquiry into its history and a comprehensive philosophical treatment of its principles.

Spec'ulum Metal, a hard steel-white alloy of copper and tin, usually in the proportions of two to one respectively. It is susceptible of a high polish, and for that reason is employed for the mirrors of reflecting telescopes.

Speech. See LANGUAGE, LETTERS, and SOUND.

Speed, John, born in 1555, at Farington in Cheshire, was an antiquarian of enormous industry. In 1608 and 1610 he printed fifty-four maps of England and Wales, and in 1611 appeared his *Chronicle*, published as *The History of Great Britaine under the Conquests of ye Romans, Saxons, Danes, and Normans*. This was the completest history of its day, and it was the first to disregard the mythical fabrications of chroniclers like Geoffrey of Monmouth. In the same year appeared his *Theatre of the Empire of Great Britaine*, and in 1616 he published a theological work entitled *A Cloud of Witnesses*. S. likewise wrote *A Prospect of the Most Famous Parts of the World* (1631). The sub-title of the last was *The Genealogies of Scripture*, and it was often bound up with Bibles. S. died in 1629.

Speed'well (*Veronica*), a large genus of *Scrophulariaceæ*, consisting of annual or perennial herbs and shrubs widely distributed through N. temperate regions, occurring also in Australia and New Zealand. The leaves are generally opposite; the flowers on axillary or terminal racemes, rarely solitary, usually blue; corolla rotate or sub-campanulate; limb 4-cleft; stamens 2; capsule usually compressed. Ten species are common or frequent English plants, some as weeds of cultivated or waste ground; others of hedge banks, woods, and copses; and others of bogs and watercourses. Of these the Germander S. (*V. Chamædrys*) with bright blue flowers is a general favourite. *V. saxatilis* of the Scotch Alps is one of the most beautiful of indigenous plants. Five other species are either rare or are colonists. A number of hardy perennial species are grown in gardens as ornamental border plants; while the handsome shrubby kinds from New Zealand have long been introduced into greenhouses. The properties are unimportant. *V. beccabunga* (British) is a reputed antiscorbutic (see BROOKLIME). An infusion of the astringent bitter leaves of *V. officinalis* (also British) is used as a 'herb-tea.'

Speiss, a compound of the arsenides and sulphides of nickel, iron, and copper, formed in the preparation of smalt from cobalt. It is one of the principal sources of nickel.

Speke and **Grant**, two names intimately associated in the history of African discovery.—**John Hanning S.** was born at Jordans, Somersetshire, May 4, 1827, and educated at the grammar-school of Barnstaple. When seventeen years of age he went to India, joined the native Bengal infantry, and served in the Punjaub. He rose to the rank of lieutenant, and during leave of absence in 1854 a chance encounter with Captain Burton (q. v.) at Aden, turned his mind to the perilous task of African discovery. He joined Burton and Lieutenants Herne and Stroyan in their expedition to Harrar and the Somali country. The exploit ended in disaster; the party was attacked after falling back to the coast; Stroyan was killed, and S. escaped with eleven wounds. In June 1857 S. and Burton again set out, directed by the Royal Geographical Society to search for the Nile source in the regions S. of the equator. Following the track of Krapf and Rebmann, they entered the country from the Zanzibar coast, and advancing boldly westwards, discovered the great lake Tanganyika (q. v.), and a crescent-shaped mountain mass overhanging the N. half of the lake, supposed by S. to be the true Mountains of the Moon. Burton fell sick, and remained to recruit on the shores of Tanganyika, while S. proceeded N. and discovered the S. end of Victoria Nyanza (q. v.), 3d August 1858. In his journal he wrote that he felt no doubt that the lake gave birth to the Nile, and the discoveries of Baker, Stanley, and others have confirmed the conjecture, the Shibiyu being rather a feeder of the lake than a continuation of the great river. In 1861 S. and **James Augustus G.** headed another expedition to the region of the great lakes.—G., the son of the Rev. James G. of Nairn, Scotland, was born in 1827, educated at Nairn and Marischal College, Aberdeen, and appointed to a cadetship in the Indian army in 1845. He served at both sieges of Mooltan, and received a medal for his conduct in the battle of Gujerat under Lord Gough. While commanding two companies of the 78th Highlanders at the relief of Lucknow

he was wounded, and subsequently retired with the rank of major in the Bengal army. The expedition in which he joined S. approached Victoria Nyanza from the E. coast, traced its W. side from the town of Mashonde northwards to the effluence of the Nile at the rapids, which the travellers named the 'Ripon Falls,' in honour of the president of the Geographical Society. Traversing the kingdoms of Karagwe and Uganda, on the W. and N. sides of the lake, they made their way to Gondokoro, where they were met by a relief expedition under Sir Samuel Baker (q. v.). S. and G. had heard of another great lake lying W. of their route, and Baker, taking up the search, discovered the Albert Nyanza (q. v.) 14th March 1864. S., who received gold medals from the Geographical Societies of Paris (1860) and London (1861), was the author of a *Journal of the Discovery of the Source of the Nile* (1863) and *What Led to the Discovery of the Source of the Nile* (1864). On the 15th September 1864 he was killed by a gun accident while out shooting in the vicinity of Bath, at which place he was to have met the British Association on the day following. G., who received the honour of C.B. in 1866, subsequently published *A Walk across Africa*, *A Summary of the S. and G. Expedition* (Royal Geograph. Journal, 1872), and *Botany of the S. and G. Expedition* (Linnæan Soc. Trans. 1872). In 1868 he was head of the Intelligence Department of the Abyssinian Expedition, and was made C.S.I. for his services. Since then, as a member of the Council of the Royal Geographical Society, he has continued to assist African exploration, and especially to organise the expedition under Mr. Keith Johnston which is now (1878–79) opening up the country between Lakes Nyassa and Tanganyika.

Spel'man, Sir Henry, born at Congham, Norfolk, in 1562, passed from Walsingham School to Trinity College, Cambridge, and thence to Lincoln's Inn (1580). He served as high sheriff of Norfolk (1604), as a commissioner for settling land-titles in Ireland, and for inquiring into the exaction of English fees; then, having been knighted about 1612, withdrew from public life and devoted himself to archæology and a study of the Old English tongue. He died in 1641, leaving unfinished his *Glossarium Archæologicum* (vol. i. 1626; vol. ii. completed by his son and Dugdale, 1664; 2d ed. 1 vol. 1687) and *Concilia, Decreta, Leges, Constitutiones in Re Ecclesiastica Orbis Britannici* (vol. i. 1639; vol. ii. by Dugdale, 1664). A Life by Bishop Gibson is prefixed to *Reliquiæ Spelmannianæ* (Oxf. 1698). His son, Sir John S., who died at Oxford, July 25, 1643, edited the *Saxon Psalter* (1641), and wrote a *Life of Alfred the Great* (Lat. trans. 1678; Eng. 1709).

Spen'cer, a Warwickshire family tracing its descent from a younger brother of the Hugh de Despencer who was justiciary of England in 1264. A Sir Robert S., raised to the peerage as Baron S. of Wormleighton, Warwickshire (1603), was grandfather of the first Earl of Sunderland (q. v.), and through him of the second Duke of Marlborough; and John, a grandson of the third Earl of Sunderland, was created first Earl S. (1765). His grandson, **John Charles S.**, born 30th May 1782, proceeded from Harrow to Trinity College, Cambridge, and took his M.A. (1802). As Viscount Althorp he entered Parliament for Okehampton in 1804, and sat for Northamptonshire from 1806 till his accession to the earldom (1834). During these thirty years he gained a foremost place in the Whig ranks by what Jeffrey styled his 'calm, clumsy, courageous, immutable probity and well-meaning.' The Reform Law (1832) and Poor Law Amendment Act (1834) owed much to his support, and he was Chancellor of the Exchequer and leader of the House of Commons (1830–34) under Lord Grey, who always spoke of Althorp as his 'right-hand man.' After his elevation to the Upper House he chiefly devoted himself to the advancement of agriculture, being president of the Royal Agricultural Society from its foundation at his suggestion in 1837. He died at Wiseton Hall in Nottinghamshire, 1st October 1845, and was succeeded by his brother, whose son, **John Poyntz S.** (born October 27, 1835), becoming fifth earl (1857), was Lord-Lieutenant of Ireland (1868–74).

Spen'cer Gulf, a large inlet on the S. coast of S. Australia. It is 180 miles long, with a breadth gradually decreasing northwards from 95 to 3 miles.

Spen'cer, Herbert, one of the most eminent of living philosophers, was born at Derby, 27th April 1820. At an early age he became a civil engineer, but quitted the profession about the time of the railway mania. He contributed to the *Civil Engineer* and *Architect's Journal*, and wrote a series of articles in the *Nonconformist* (1842) on 'The Proper Sphere of Government,' and shortly afterwards began to write regularly in the *Economist*. His first work of note was the *Social Statics* (1851), which was followed by the first edition of his *Principles of Psychology* (1855; 2d ed. 1870), pronounced by J. S. Mill 'the finest example we possess of psychological method in its full power.' In 1860 he announced a systematic series of philosophical treatises still in progress, beginning by the publication of his *First Principles* (1862). The series comprises, besides *First Principles*, vols. ii. and iii. 'Principles of Biology' (1867), iv. and v. 'Principles of Psychology' (1872), vi., vii., and viii., 'Principles of Sociology' (1877), ix. and x. 'Principles of Morality.' These volumes are still being issued from time to time, but the greater part of them have already appeared. S. does not profess to exhibit in them detailed treatises, but rather the first principles of each of the great departments of human knowledge.

There is an interesting sketch of S.'s system in Professor Ribot's *Contemporary English Psychology*. The distinguishing feature in S.'s system is the application of the doctrine of evolution to the departments of biology, psychology, and sociology. These he refuses to regard as distinct, asserting universal *continuity* in the phenomena of experience. His method has a double aspect, being analytical as well as synthetical. In that portion of his work which deals with psychology, he shows that the elements of which mind is composed are two, feelings and the relations between feelings, and that these are still further reducible to a succession of dissimilar nervous shocks, from which we pass into the psychological sphere. Evolution is defined to be the transition from the homogeneous and simple to the heterogeneous and composite, and in his various treatises S. exhibits the operation of this principle as the outcome of the doctrine of the persistence of force.

Spe'ner, Philipp Jakob, the founder of the German pietists of the 17th c., was born 28th January 1635 at Rappoltsweiler in Upper Elsass. He was from an early age destined for the church, and with this object studied at Strassburg, Basel, Tübingen, Freiburg, Geneva, and Lyon. At the last of these places his attention was for some time attracted by the science of heraldry, and he published several volumes exhibiting such research that he became one of the authorities on the subject. He then lectured at Strassburg, where he received in 1664 the degree of Doctor in Theology. In 1660 he was appointed chief clergyman at Frankfurt-on-the-Main, and here he gave himself entirely up to the proper work of his profession. The Lutheran Church of that period was under the dominion of a dead orthodoxy. S. said, 'We must have life as well as doctrine.' 'We must have the living faith of Luther as well as his orthodoxy,' and so by preaching, writing, and teaching, he unweariedly strove to infuse into others that evangelical ardour which glowed so brightly in his own mind. From 1686 to 1691 he was court preacher at Dresden, and here he formed and carried out many plans for the religious instruction of the young. His faithful dealing with George III., the ruling prince, led to his removal to Berlin. A subsequent reinstatement in office which was offered to him he declined. In 1695 the University of Wittenberg condemned 264 'errors' in his writings, but those whom he had inspired to earnest Christian effort gathered devotedly round him, and fresh adherents were added every year. Widely loved and regretted, he died at Berlin, 5th February 1705. See Hossbach, *Ph. J. S. und seiner Zeit.* (2 vols. Berl. 1828; 3d ed. 1861); Thilo, *S. als Katechet* (Stuttg. 1841); Wildenhalm, *P. J. S.* (Leip. 1842–47).

Spen'ser, Edmund, was born in London, in East Smithfield, probably in the year 1552. He entered as a sizar at Pembroke Hall, Cambridge, in 1569, became B.A. in 1573, and M.A. in 1576. In 1569 appeared a book 'devised' by S. John Vander Noodt, the title of which begins—*A Theatre wherein be represented as well the Miseries and Calamities that follow the Voluptuous Worldlings, as also the greate Joyes and Plesures which the Faithfull do enjoy*: this volume was prefaced by the first six of Petrarch's *Visions* done into verse styled 'Epigrams,' and 15 'Sonets,' which were published subsequently among S.'s works, in which publication they are said to have been 'formerly translated.' The poet left Cambridge for the north of Eng-

land, the dialect of which may be traced in his next published poem; his friend Gabriel Harvey, however, brought him south, and about the year 1578 introduced him to Sir Philip Sidney. To Sidney he dedicated *The Shepheardes Calendar* (1579), a set of pastorals only differing from the fashion of the times in giving honest rustic language instead of courtiers' phrases to the shepherd swains; and next year this patron's influence got S. the appointment of secretary to Lord Grey de Wilton, Lord-Lieutenant of Ireland. From that date till he visited England with Raleigh in 1589, it is probable that S. lived continuously in Ireland, gaining experience which was afterwards embodied in the *View of the State of Ireland*, presented to the Queen in 1596, but not printed till 1633. In 1589 he was visited by Raleigh at Kilcolman Castle, Cork county, where his friends obtained for him from Queen Elizabeth 3028 acres of land, the grant, which is extant, being dated October 26, 1591. The *Faerie Queene* was already begun in 1580, and three books were finished by the close of the year 1589. Raleigh was so much delighted with what S. showed him of his poem, that he carried him over to England, where it was printed. S. was also introduced to Elizabeth, who, a year after the publication of the *Faerie Queene* (1590), made him virtually her laureate with a pension of £50 a year. In the same year he returned to Ireland, and no sooner was his back turned on London than the publisher of the *Faerie Queene* gathered all scraps of his minor poems together and published them in a volume entitled *Complaints*, which include *The Ruines of Time, The Teares of the Muses, Virgil's Gnat, Mother Hubbard's Tale, The Ruines of Rome by Bellay, Muiopotmos, or The Tale of the Butterflie, Visions of the Worlds Vanitie, Bellayes* and *Petrarches Visions.* In 1592 he married a lady named Elizabeth, to whom his *Amoretti*, or *Sonnets* (1595), are addressed, and who is celebrated in his *Epithalamium*, 'the most perfect of all his poems, the most beautiful of all bridal songs.' He tells us that this wife, though beautiful, 'was certes but a countrey lasse.' At the same time as the *Amoretti* appeared *Colin Clouts come Home Againe;* and probably, at the close of the same year, S. returned to England to superintend the publication of books iv.-vi. of the *Faerie Queene.* During his stay in England he wrote the *Hymns to Heavenly Love and Heavenly Beauty* and the *Prothalamium*, his last works. In 1597 he returned to his quiet life at Kilcolman, but in the next year Tyrone's rebellion forced him to flee, for he represented government as clerk of the council of Munster, and was sheriff-designate of Cork. His house was burnt, and a child perished in the flames, according to a statement made by Ben Jonson to Drummond of Hawthornden. S. reached England broken-hearted, and died, January 16, 1599, in a tavern in King Street, Westminster, 'for lack of bread,' as Jonson told Drummond. This, however, must have been an exaggeration, for though S. returned 'inops,' according to Camden, he was still in receipt of a pension, and must still have had influential friends. He was buried near Chaucer in Westminster Abbey.

After Shakespeare, S. ranks with Chaucer and Milton. For pure beauty—whether as regards the subjects of his descriptions, or the rich harmony of their language—no poem compares with the *Faerie Queene.* Its aim is first of all religious. In the opening book we have the Red Cross Knight to represent the Christian, beloved of Una, the true Church, but beguiled into error by Duessa, or Popery. The knight is only restored to Una by the intervention of Prince Arthur, who is the leading character of the whole poem, and personifies 'magnificence' or magnanimity, 'which vertue is the perfection of all the rest, and containeth in it them all.' Book by book various virtues are personified; and the entire allegory is the splendid prototype of all such works as Bunyan's *Pilgrim's Progress.* But while the story of chivalry is sustained, and allegorises the history of the Christian Church, many other references are introduced into it, and these are all woven into each other with great skill. Thus the Faerie Queen represents at once Glory and Queen Elizabeth; Duessa represents Falsehood, Popery, and Mary of Scotland; Arthur represents chivalrous Magnanimity, Christ the Redeemer, and the Earl of Leicester. But all these are only the threads of the practical, on which is worked the richest of tapestry. Spenser never draws tears, never quickens the pulse, but he is the omnipotent king of fancy; and while he deals with Platonic virtues in a world of chivalrous romance, yet so exquisitely and naturally associates all with the fresh fair world around us that we believe him utterly. In Bunyan, the dramatically-embodied moral chiefly draws attention, and the merely mundane interest of the story is small; in S., the stern Puritanism underlying the allegory is hid to the careless reader, who is presented with ever-shifting pictures of the pure external world, and hears more of the dignity than of the misery of man. Another charm of the *Faerie Queene* is its 'Spenserian stanza.' This adds an Alexandrine to the eight-line stanza used by the old French poets, and even by Chaucer. The old form consisted of two quatrains of ten-syllabled lines, alternately rhyming, but the second rhyme of the first quatrain agreeing with the first rhyme of the second. S.'s last line rhymes with that preceding it, and by disappointing the sustained expectation of completed rhythm with two additional syllables, gives our verse one of its most majestic cadences. S. intended the *Faerie Queene* to occupy twelve books, of which six only were accomplished. S., while deeply impressed with the present, lived in a world that was departed, and consequently his poem took an antique cast, drawing its images, its manners, its scenery, and its very language from the past. 'He stands between two worlds: he belongs partly to the new time, partly to the old; he is the last of one age, he is the first of another; he stretches out one hand to Chaucer, the other rests upon the shoulder of Milton.' The chief editions are Upton's (2 vols. 1758), Todd's (8 vols. 1805), Pickering's Aldine (5 vols. 1825), Child (Bost. U.S. 1855), and Collier's (5 vols. 1862), and the Globe ed. by Morris, with Memoir by J. W. Hales (Lond. new ed. 1871). An edition of the first two books, by Kitchin, with glossary, forms two volumes of the Clar. Press series of school texts.

Spermace'ti, or **Ceta'ceum**, is a white concretion or waxy matter prepared from the oily matter in the head of the *Physeter macro-cephalus*, or sperm whale, inhabiting the Pacific and Indian Oceans. Cetine, nearly pure, is separated from the oil by cooling, filtration, and pressure. S. is used in medicine as an emollient and demulcent in chronic diarrhœa, in doses of 20 to 60 grains, boiled in milk, two or three times daily. The S. of commerce is a glittering pearly-white substance in thin plates or crystals, destitute of either odour or taste. Sperm candles made from S. with about 3 per cent. of wax yield a light of unequalled steadiness and brilliancy, and they are used as a standard of comparison of the illuminating power of all varieties of artificial light.

Spermatozo'a, the name given to the vibratile moving filaments observed in the *seminal fluid* of animals, and which appear to be essential for impregnation. The S. have been seen to penetrate the substance of the *ovum* or egg during impregnation —an act which consists in the contact of the S., or male element, with the ovum or female element. The S. of man have pear-shaped heads and vibratile tail-like filaments, and attain a length of the $\frac{1}{600}$th part of a line.

Sperm Whale. See WHALE.

Spes Successio'nis is, in Scotch law, the right or hope of succession. It may be sold, but it cannot be adjudged. In rights taken to parent and child, unless very explicit terms are used to limit the father's right to a liferent, he is understood to have the fee, and the child's right is merely a S. S. See FEE AND LIFERENT.

Spey, a river of Scotland rising in the Corrvarrick Hills, in Badenoch, 6 miles N.W. of Loch Laggan, flows N.E. through the counties of Inverness and Elgin, and falls into the Moray Firth after a course of 95 miles. The area of its basin is 1245 sq. miles. The S. has the swiftest current of any river in Great Britain, and is subject to sudden floods. Its salmon fisheries are worth £6000 a year.

Spey'er, or **Spei'er** (Fr. *Spires*), the capital of the Bavarian Palatinate and the seat of a bishop, lies on the Rhine, 14 miles S.W. of Heidelberg by rail. The most important buildings are the cathedral, the Hall of Antiquities, the Altpörtel, and the remains of the Retscher or imperial palace. The cathedral, reckoned the finest specimen of Romanesque architecture in Europe, was founded in 1030 by Konrad II. as a burial-place for himself and his successors, and completed in 1061 by his grandson Heinrich IV., the opponent of Pope Gregory the Great. On several occasions it suffered severely at the hands of the French, especially in 1794, when it was turned into a barn; but in 1822 it was re-consecrated, and in 1858 the work of restoration was completed. Its length is 485 feet, breadth of nave nearly

50 feet, height of the four towers 237 feet. The interior is richly decorated with some of the finest specimens of modern German art. S. has cigar and vinegar works, and does a little transit trade on the Rhine. Pop. (1875) 14,318. Under the Romans S. was known as Augusta Nemetum, and during the Middle Ages it was a place of considerable importance, twenty-nine imperial diets having been held within its walls, at one of which (1529) the Reformers offered the protest which procured for them the name of Protestants. During the wars of Louis XIV. in the Palatinate, S. was several times sacked by the French, and in 1689 the whole town was committed to the flames, the cathedral alone resisting the attempts of the French engineers to undermine it.

Spe'zia, the chief arsenal of the Italian kingdom, a station for ships of war, and a commercial port of some importance, is situated at the head of the Golfo della S., 57½ miles by rail S.E. of Genoa. The harbour (*Lunæ Portus* of the Romans) is formed by two spurs of the Apennines, and is one of the finest on the Mediterranean. Its safety has recently been increased by a breakwater 7150 feet long, built across the mouth. The naval arsenal, begun 1861, cost $9,000,000. The mildness of the climate and beauty of the environs attract numerous visitors to S. both in winter and summer. Its trade with Great Britain is chiefly in coal, and has decreased of late years. Tonnage in 1877, 13,835. Pop. (1876) 25,820.

Spezz'ia, or **Spetz'a,** a small rocky island off the coast of Argolis, at the entrance to the Gulf of Nauplia, with a town of the same name, containing (1871) 8443 inhabitants, was formerly a nest of pirates, but from about the commencement of this century has developed some small trade. Area of the island, 6¼ sq. miles; pop. 9400.

Sphærula'ria, a genus of *Nematode* worms, belonging to the order *Gordiacea*, and found inhabiting the bodies of humble bees. The female attains a length of ¾ inch, has its body studded over with minute button-like projections, but is destitute of a digestive system.

Sphag'num is the sole genus of the sub-class *Sphagnaceæ* of *Musci* or Mosses (q. v.). There are numerous species—all essentially aquatic plants, and found in all temperate climates of the world. From their usual habitat they have acquired the name of bog-mosses. In bogs they form compact beds of a whitish, yellowish, green, or lilac surface, presenting a fictitious appearance of firm ground. As decay takes place in the lower part of the plant, the upper parts maintain a vigorous life, drawing up water from below like a sponge. The substructure becomes denser in course of time, favouring thereby the growth of stronger vegetation, and ultimately the bog may become a peat-moss. Pulled and dried S. is, from its elasticity, an excellent material for packing plants; and when moistened cannot be surpassed for enveloping the roots of those plants that have to travel a long distance before they can be planted.

Spheg'idæ, a family of *Hymenopterous* insects, having 'the posterior margin of the thorax not prolonged backwards to the insertion of the wings, and anteriorly produced into a neck with the abdomen petiolated.' The burrowing legs are long and spiny, and the mandibles are large. The S. sting other insects, and lay them them up as food, the insects being only partially paralysed. The nests of the S. are built in the sand, or are made of mud daubed on to walls.

Sphe'noid Bone (Gr. *sphēn*, 'a wedge,' and *eidos*, 'shape'), an important bone of the skull, placed at the front part of the base, and articulating with all the other bones of the cranium. It consists of a *body*, two greater and two lesser wings or *alæ*, and two *pterygoid processes* projecting from its under surface. The *upper surface* bears the *ethmoidal spine* which articulates with the ethmoid bone; behind this spine are grooves for the *olfactory* and *optic nerves*. The *body* of the bone supports the *pars varolii*, and on each side of the body a deep groove (*cavernous groove*) lodges the *internal carotid artery* and the *cavernous sinus*. The *posterior surface* articulates with the basilar process of the occipital bone. The *front surface* of the S. B. assists in forming the septum of the nose, and on either side of the front surface are the *sphenoid cells* or *sinuses*. The *pterygoid processes* of the S. B. serve as points of attachment for important muscles.

Sphere, in geometry, is a surface every point of which is equidistant from a particular point known as the centre. Hence a straight line drawn through the centre and terminated at both ends by the surface is bisected at the centre. Such a line is called a *diameter*, and any line from the centre to the surface is a *radius*, exactly as in the case of a circle. Any orthogonal projection or perspective representation of a S. or any plane section of a S. is indeed a circle. If the cutting plane passes through the centre, the circle of section is called a *great circle*—the section by any other plane is known as a *small circle*. Conceive the cutting plane to move parallel to itself so that the circular section grows smaller and smaller, a point will at last be reached when the section shrinks into a point, becoming a circle of infinitely small radius. If the plane is moved back ever so little the section becomes a finite circle, if it is moved forward ever so little the section ceases to have real existence. Such a plane is termed a tangent plane, and, since three points determine a circle, may be defined analytically as the plane passing through three *coincident* points upon the surface. The tangent plane at any point is perpendicular to the radius to that point—a property which holds for a circle and its tangent line. From any point P outside a S. an infinite number of tangent planes can be drawn which touch the S. in a small circle. The plane of this circle is called the polar of the point P; and the lines drawn from P to the circumference form a cone of revolution which is a tangent-cone to the S. (see POLE AND POLAR). The surface of a S. is equal to the curved portion of the surface of the circumscribing cylinder, and its volume is equal to two-thirds of the volume of the same cylinder. The equation of a S. referred to rectangular axes though its centre is $x^2 + y^2 + z^2 = a^2$, a being the radius. A *sphero-conic* is the curve in which a S. intersects a quadric cone whose vertex is at the centre of the circle. Such a curve is not plane, but it possesses many properties analogous to those of plane quadric curves such as the ellipse and hyperbola. Sphero-conics were first systematically investigated by the French geometer Chasles, and they will be found discussed in considerable detail in Salmon's *Analytical Geometry of Three Dimensions*, where also the most important properties of the S. and its related quadric surfaces are fully treated.

Spheroid' is an Ellipsoid (q. v.) with two of its axes equal. Hence its equation to rectangular axes through the centre is $\frac{x^2}{a^2} + \frac{y^2 + z^2}{b^2} = 1$. Its section by the plane $yz(x=o)$ is evidently a circle; while the planes zx and xy cut the surface in equal ellipses. Consequently a S. may be regarded as the surface of revolution of an ellipse round either axis; and according as this axis is the minor or major the S. is *oblate* or *prolate*.

Spheroid'al State is the name given to an interesting phenomenon, generally ascribed to Leidenfrost, whose experiments were published in 1756. There is no doubt, however, that the phenomenon had been observed long before, and that ten years previously Eller had made it a subject of investigation. In the *Dublin Philosophical Journal* for 1826, a short account is given of several experiments of Perkins in relation to high-pressure engines, which anticipated many of the results given in Boutigny's *Etudes sur les Corps à l'Etat Sphéroidal* (1857), still the standard work upon the subject. The experiment is usually performed by placing a drop of water upon a red-hot metal dish, slightly concave, when the drop of water assumes a more or less flattened spheroidal form, like a drop of mercury upon a plane glass surface. There is no true contact between the liquid and the solid, which must be for water at a temperature above 171° C. It is possible, however, to allow the temperature of the plate to fall to 142° before true contact occurs; but this requires very delicate manipulation. The water in the S. S. is at a temperature of 97° C. Other liquids may be made to behave in the same way; and the lowest temperatures at which alcohol and ether assume the spheroidal states are respectively 134° and 61° C. The temperatures of the liquids themselves are 75° and 34° respectively. In all cases the temperature of the liquid is a few degrees lower than its boiling-point. The explanation of the phenomenon is that between the liquid and the solid a cushion of vapour is formed which prevents contact of the two, and at the same time, by the dance of molecules between the opposed surfaces, supports the mass of water some distance above the dish. The action is therefore the same as in Crookes' Radiometer (q. v.). If the dish be allowed to cool before the drop has evaporated—for slow

evaporation is always going on—a violent explosion occurs when the temperature is sufficiently low to permit the liquid to come into contact with the solid. Instead of a solid, the surface of a liquid, capable of being raised to a high temperature, may be used. A red-hot ball, when lowered into a vessel of water, glows for some time before the inevitable hissing is heard, there being formed round the ball a shell of water-vapour, through which conduction takes place slowly. Passing the moistened hand through molten lead is an example of the same phenomenon, the hand being protected by the film of vapour which forms round it.

Sphinc'ter Muscles (Gr. *sphinktēr*, 'what binds close'), the name applied to the muscles that surround the orifices of the body, and serve to close the apertures by their contraction, as the S. M. of the bladder, anus, and vagina.

Sphinx. See HAWK-MOTH.

Sphinx (Gr. 'throttler,' Egypt. *neb*, 'lord,' or *akar*, 'intelligence'), a mythical figure frequently met with in Egyptian art, with a lion's body and the head of a hawk (*hieracosphinx*), a ram (*criosphinx*), or oftener a human being (*andriosphinx*). In the latter case it variously represented several kings of the eighteenth dynasty, two queens, or the solar god Kar-em-achu (Horus); while as a hawk it stood for Mantu, another solar deity, as a ram for Xnum (Ammon). Of all the andriosphinxes the most renowned is that of Gizeh, 100 yards to the E. of the Second Pyramid, which, hewn from the living rock, is 51 feet high and 110 feet long. Travellers describe this S. as beautiful or sinister, mocking or passionless; in truth it is but a knob of stone, perched on a lengthy neck, shorn of its beard, which is now in the British Museum, with traces of red paint just indicating the eyebrows and right cheek, and its body buried in the desert sands. The excavations of Caviglia (1816) and Mariette (1852) have only proved it to be certainly older than the eighteenth dynasty, possibly as old as the fourth, *i.e.*, contemporaneous with Safra (Cheops), the builder of the adjacent pyramid. Statues of Safra, found close by, seem to connect it with that monarch; and tablets have been unearthed between the paws, recording its worship by Thothmes IV.—a worship which, lasting through the eighteenth dynasty, was revived in the days of the Roman empire. Other famous sphinxes are the red granite S. of Amenophis III., now at St. Petersburg; that of Menophtah, in the Louvre, and the S. avenues of Saccarah, Karnak, and the Wady Esseboua. Sphinxes figure in Assyrian, Phœnician, Etruscan, and Hellenic art. In the last they are always female and winged, while the S. in the Theban myth of Ædipus (q. v.) had also a serpent's tail.

Sphyg'mograph (Gr. 'pulse-writer'), a delicate combination of levers, used for graphically recording the action of the pulse by a representative wave-form. Its indications are of value in diagnosing certain diseases of the heart.

Sphyræ'nidæ, a family of Teleostean fishes allied to the Perch (q. v.), but having abnormal ventral fins. There are two dorsal fins, and the scales are cycloid. The teeth are numerous and sharp. The Barracouda Pike is a good example. This fish occurs in the Atlantic Ocean, and is a very formidable creature.

Spicca'to (Ital. 'detached'), a term used in music to indicate that the consecutive notes are to be played distinctly, and as though detached from each other. Such passages are commonly marked by dots placed over the notes.

Spice Islands. See MOLUCCAS.

Spi'ces (Lat. *species*, 'kinds' or 'sorts;' first applied in later Latin to any kind of goods; afterwards to the rare aromatic products of the East) embrace vegetable substances containing volatile oils having a certain pungency of taste and an agreeable aromatic odour, and used as adjuncts to food partly on account of their stimulating pungency, and partly from the pleasant flavour they communicate. The term is generally restricted to the flavouring substances used with sweetened articles of food, such as preparations of flour, starches, and the diet drinks, the term condiments being given to analogous substances which are eaten with animal foods and salted substances. The S. include ginger, cinnamon, cassia, nutmegs and mace, cloves, allspice or pimento, and caraway, coriander, &c., all of which are separately noticed. Many minor S. are also used, the value of which depends on the volatile oil which they contain.

Spich'eren, or **Spich'ern**, a village in the circle of Forbach, Elsass-Lothringen, 2½ miles S. of Saarbrucken, with 1000 inhabitants. During the Franco-German War the French strongly entrenched themselves on the S. Berg (875 feet), with its steep, scantily-wooded slopes, but after a sharp engagement, 6th August 1870, were obliged by the Prussians, under General von Goeben, to retreat though numerically superior.

Spi'der, the name given to animals belonging to the *Arthropodous* order *Arachnida* (q. v.). In this group the head and chest are united to form a segment known as a *cephalothorax*. The legs number eight, there are no antennæ or feelers, no wings are developed, and the breathing is inducted by means of pulmonary or lung-sacs. The abdomen is provided with three pairs of jointed organs named *spinnerets*, which are homologous with limbs. The nearest affinities of spiders are with the dipterous insects or flies. Such genera as Nycteribia amongst Diptera show affinities to Arachnida, and some of the lower Arachnidans (*e.g.*, mites) show affinities in their turn to Crustaceans. Packard says 'we must look upon the S. as a *hexapodous* insect, degraded, wingless, and partially *decephalised*.'

In some spiders the union of the head and chest is not so completely carried out as in others. The *mouth-parts* consist of a pair of large *mandibles* or jaws, which bear a movable limb or *fang*, communicating internally with a poison-gland. To the mandibles succeed a pair of *maxillæ*, or lesser jaws, having very large *palpi* or feelers in the males, these organs being used to apply the seminal fluid to the female generative organs. There is also a *labrum* or upper lip, and *labium* or lower lip. The *digestive system* includes a distinct stomach, produced at the sides with appendages. A *liver* exists, and also a renal organ. The *heart* lies dorsally, and consists of a single pulsating cavity, circulating pure blood headwards. The *breathing organs* in spiders are in the form of *pulmonary* or *lung-sacs*, usually numbering four on each side of the body. Each sac is merely an involution of the integument, opening externally by a distinct *stigmatic* aperture on the under surface of the abdomen. The inner surface of the sac is divided into a number of very thin *lamellæ* or plates, over which bloodvessels ramify, and thus expose their contained fluid to the air. In addition to these organs, breathing-tubes or *tracheæ*, similar to those seen in insects, occur in spiders. The *spinnerets* or silk-glands and weaving-organs are placed towards the extremity of the abdomen. Usually five silk-glands are developed, and the secretion of these is a fluid so long as it remains therein. On exposure to the air the silk becomes viscid, and is capable of being pressed out through the spinnerets into fine threads. Each thread used in making the web is composed of hundreds of different strands. The thread is guided by the hind feet in making the web. The *sexes* are distinct in the S., the female being the larger and more powerful. The two *ovaries* of the female open between the lung-sacs. The eggs are laid in June.

The S. belongs to the order *Araneinæ*, in which the mandibles are used for biting, the abdomen being unsegmented (and thus differing from that of the nearly allied Scorpions), whilst the maxillæ resemble the thoracic legs. The young do not undergo a *metamorphosis*. Latreille's classification includes the *Tetrapneumones*, or those (*e.g.*, *Mygale*) in which four lung-sacs are developed, whilst only two pairs of spinnerets are represented. To this group belong *Mygale avicularia*, the Bird S., *M. nidulans*, and other species of 'Trap-door' spiders. The *Dipneumones* have only two lung-sacs and three pairs of spinnerets. To this group belong the genera *Dysdera*; *Argyroneta aquatica*, the Water S.; *Tegenaria epeira* (with a globular abdomen), including the Garden S. (*E. diadema*); the Tarantula genus (*Lycosa*), including the famous tarantula (q. v.); the genus *Salticus* includes the 'Leaping S.', so named from their jumping gait.

Spider-Crab, the name given to various Crustacean genera included in the order *Decapoda*, and belonging for the most part to the family *Maiadæ*. The typical species *Maia Squinado* or spinous S. C., is four or five inches long; but the other forms so named are very much smaller.

Spider-Fly (*Chionea*), a genus of *Diptera*, or flies in which wings are wanting, and in which a close resemblance to spiders is seen. They belong to the family *Muscidæ*, are born alive, and have a nervous system as in spiders.

Spider-Monk'ey (*Ateles*), a genus of *Platyrhine* or New World apes, having broad or widely-separated nostrils, a prehensile tail, and long slender limbs, hence their popular name. They belong to the family *Cebidæ*, in which there are no cheek-pouches or callosities. The *A. paniscus* or *Coaita* and the Chameck (*A. chameck*) are familiar species.

Spiegelei'sen (Ger. 'mirror iron'), a peculiar variety of pig-iron in which a large proportion of carbon and of manganese is present. The name arises from the fracture of the material showing large smooth shining plates resembling mirror glass. S. is very largely used in the processes for making steel which have been introduced within recent years (see STEEL).

Spiel'hagen, Friedrich, a German novelist, was born at Magdeburg, 24th February 1829. Brought up at Stralsund, where his father was *baurath* from 1834, he studied at Berlin, Bonn, and Greifswald, and having successively been tutor, actor, and officer in the Landwehr, took finally to literature, settling at Berlin in 1862. His 'social' novels, most of which have been translated into English, are over-long and surcharged with invectives against the clergy and aristocracy, but their power is great, and from first to last they have steadily improved. The earliest, *Clara Vere* (1857), has been followed by *Problematische Naturen* (1861), *Durch Nacht zum Licht* (1862), *Die von Hohenstein* (1864), *In Reih und Glied* (1866), *Hammer und Amboss* (1868), *Deutsche Pionniere* (1870), *Die Sturmflut* (1877), &c. S. has also published many translations from French and English.

Spige'lia, a genus of *Loganiaceæ*, named in honour of Dr. Spigelius, who died 1625, and containing about 30 species of annual or perennial herbs of tropical and sub-tropical America. *S. marilandica*, with beautiful carmine funnel-shaped flowers, is the most important. It is called worm-seed and Caroline pink, and furnishes the Indian pink-root of the shops. This drug is officinal in the United States pharmacopœia as a vermifuge; it also has a stimulant action on the heart and arteries. *S. anthelmia*, an annual species of S. America, has similar properties.

Spike, in botany, is applied to an Inflorescence (q. v.), when the flowers are sessile along a simple undivided axis or rhachis, as for instance in the common plantain and the lavender. The *catkins* of many British trees, the *spadices* of arums, and the *ears* and *spikelets* of numerous grasses, are also forms of the S.

Spike'nard, or **Nard**, is a substance that has enjoyed celebrity from very early times. Through the exertions of Sir William Jones as a philologist and Dr. Royle as a botanist, the source of S. was traced to a fragrant-rooted perennial herb of the mountains of Bengal and Nepaul, called by the natives 'jatamansi' and 'bal-chur.' The plant, which proved to belong to the natural order *Valerianaceæ*, was named by De Candolle *Nardostachys jatamansi*. It is probably also the nard of Scripture. Two other kinds of S. are known to be the produce of plants of the same natural order as the above. The first is *Valeriana celtica* of botanists—a perennial species of the Alps of Europe, with a particularly aromatic root; and the second has received the name of *V. Phu*. Both are collected for transmission to the East, where they are highly prized for aromatising baths. In America, *Aralia racemosa* is called S.,—the root is strongly aromatic, and is used for medicinal purposes.

Spi'king, driving a spike or nail into the vent of a piece of ordnance so as to render it unserviceable. The common spike is 4 inches long, 27 inches in diameter at the head, and about 1 inch at the point. The spring spike is 17 inches in diameter, with a flat head and a spring 2 inches in length, which expands after being passed through the vent. Common nails or the points of bayonets may be used as spikes where no others are at hand, or a shot wrapped in a piece of cloth driven hard home with a rammer will render the gun useless. S. is often resorted to on the battlefield to injure guns abandoned to the enemy, or those captured from the enemy which cannot be removed.

Spi'na Bif'ida is a tumour formed by a congenital hernia of the spinal membranes through a cleft in the arches of the vertebræ by incomplete coalescence of their laminæ. It is often associated with other congenital deformities, and, as a general rule, children so affected do not long survive, though there are cases on record in which persons with S. B. have survived beyond middle life. When operation is deemed necessary, the tumour should be tapped with a fine trocar on one side, and the fluid should be drawn off sufficient to relieve the tension, and a few drops of the pure tincture of iodine injected into the remainder. A shield, or compress, of guttapercha well padded should then be applied. Professor Morton of Glasgow has successfully treated several cases of S. B. by the injection of iodo-glycerine. See his *Treatment of S. B. by a New Method* (Glasg. 1877).

Spin'ach, or **Spin'age**, is a wholesome although somewhat insipid vegetable, consisting of the leaves of *Spinacia oleracea*, a diœcious annual belonging to the natural order *Chenopodiaceæ*. It is a native of Siberia, whence it passed westward, reaching England more than three centuries ago. The fleshy leaves are somewhat triangular in outline, deep green in colour, and for table are generally served boiled and mashed, or as an ingredient in soups and stews. Three varieties are in cultivation—the round-seeded, the Flanders, and the prickly-seeded, which unitedly yield a continued supply from April to November, and to a moderate extent through winter and spring. The plant is of rapid growth, but that the leaves may be succulent and properly flavoured, the soil should be rich and the situation open and airy. *S. tetrandra*, from the Caucasus, an annual and unisexual herb, is of equal value to the preceding, though less known. The name S. has also been given to several plants not belonging to *Spinacia*. French S. (*Atriplex hortensis*) is referred to in article ORACHE. New Zealand S. is *Tetragonia expansa*, a trailing plant with thick succulent leaves, native of Australasia, S. America, and Japan. Patience S. (*Rumex patientia*) was formerly common in gardens. The Beet S. (*Beta cicla*), a native of the seashores in S. Europe, has long been grown for its leaves, which are dressed in the same manner as S.

Spi'nal Cord Medull'a, or **Spi'nal Marr'ow**, is the mass of nervous matter of vertebrates, ranking next in importance to the brain as a nerve-centre, and continued directly from the body of the first lumbar vertebra. In early fœtal life it is brain, being contained within and protected by the *spinal column*. The S. C. extends from the *foramen magnum*, or large aperture in the hinder part of the base of the skull, to as long as the vertebral column, but owing to the more rapid growth of the latter, the S. C. at birth is much shorter than its investing case. Above, the S. C. is continuous with the *medulla oblongata* of the brain. Below, it becomes a thin thread-like cord, the *filum terminale* contained within the central canal of the *sacrum*. The length of the S. C. varies from 15 to 18 inches. In form it may be described as approaching the cylindrical, but it is also flattened before and behind. At the third *cervical vertebra*, and from this point to the first dorsal, the S. C. shows an enlargement named the *brachial* or *cervical enlargement*, which gives origin to the nerves supplying the arms. A similar enlargement, named the *crural* or *lumbar enlargement*, at the level of the last dorsal vertebra, is the origin of the nerves of the lower limbs. The S. C. is almost divided longitudinally into two symmetrical right and left halves by two fissures, named the *anterior* and *posterior fissure*. These halves are, however, connected by the *anterior white commissure* and *posterior grey commissure* which lie at the bottom of these fissures. The fibres of the posterior commissure enclose a minute canal, known as the *central canal* of the S. C. This canal runs throughout the length of the S. C., and is lined by *ciliated epithelial cells*. Above, this canal becomes continuous with the cavity of the fourth ventricle of the brain. Each of the halves of the S. C. appears to be divided by two fissures into three *columns*, these depressions marking the places of exit of the Spinal Nerves (q. v.). The nervous substance of the S. C. is divisible into *white* and *grey matter*. The white matter forms the external layer of the S. C.; the grey matter is internal, a transverse section appearing in the form of a double crescent. The arrangement of the white and grey nerve-matter in the S. C. is exactly opposite to that in the brain (see NERVE); since the grey matter of the brain is external, and the white internal.

Respecting the *functions* of the S. C., the views of physiologists of late years have materially changed. Formerly it was thought that the S. C. was a mere *conductor* of impulses to or from the brain; now it is definitely known, both from experiment and from its microscopic structure, that the S. C. acts as a definite *nerve-centre*, and that accordingly it may not only *originate* impressions, but also *transmit* and *direct into other channels* the nerve-impulses which pass through it. Nerve-fibres are seen to arise from the cells of its grey matter, and these-

nerve fibres may either leave the cord as the roots of its nerves, or may become continuous with the brain above when forming the columns of the S. C. The anatomical investigation of the S. C., in short, shows that it is continuous with the brain on the one hand, and with the skin, muscular, and other tissues in which its nerves end. It appears to be proved that the S. C. is the seat and origin of many of those acts which, under the name of *Reflex Actions* (q. v.), may be performed unconsciously and without the direct intervention of consciousness—*i.e.*, of brain-action.

Diseases of the S. C.—The membranes of the S. C. are liable to inflammation, which may result in serous effusion and suppuration or softening. The effusion of serum may take place between the osseous structure and the *dura mater*, there being no communication with the cavity of the cranium. The spinal *arachnoid* and *pia mater* are liable to inflammation, as in the corresponding membranes of the brain, and there may be effusion of serum both into the cavity of the spinal arachnoid and between the dura mater and the pia mater of the cord, such effusion communicating freely with the cavity of the cranium. Suppurative inflammation may also occur in the cavity of the arachnoid, and when the inflammation is acute it is frequently associated with disease of the cerebellum, but when chronic with caries of the vertebræ. The symptoms of arachnitis, or meningitis of the spinal cord, are pains in the back, with affection of the muscles, and frequently retention of urine, and paralysis may occur from pressure produced by exudation of fluid, or by extension of inflammation to the substance of the cord.

Treatment.—Meningitis of the spinal cord is treated by local depletion over the seat of pain, and by mild purgatives, such as the sulphate of soda, or of magnesia, combined with an opiate. Ergot of rye, combined with iodide of potassium, has been recommended. The warm bath is also useful, and in the later or chronic stage counter-irritation. The external application of belladonna and chloroform will be found useful in diminishing the violent pain. Perfect rest should be enjoined, and abstinence from all animal diet throughout the course of the disease.

Spinal Nerves, the name applied to the paired nerves which arise from the *spinal cord*, and which are distributed to the various parts of the body. The S. N. are so named in contradistinction to the *cranial nerves* (see NERVE), or those which originate from the brain itself. Thirty-one pairs of S. N. arise from the spinal cord of man. They pass from the spinal cord and spine through the *intervertebral foramina*, or openings between the bodies of the vertebræ. Eight pairs are *cervical*; twelve are *dorsal* nerves, also named *thoracic*; five are *lumbar*, five *sacral*, and one *coccygeal*. Each spinal nerve arises by *two* roots, an anterior and posterior, from the spinal column. The posterior root has a nerve mass or *ganglion*, which is wanting in the anterior. The fibres of the anterior roots are *motor* in nature, *i.e.*, impulses travel by these roots outwards *from* the cord or brain to the body. The fibres of the posterior roots are *sensory*, *i.e.*, impulses are conveyed by these fibres to the cord or brain (see NERVE). The anterior and posterior fibres unite just beyond the nervous ganglion to form a single nerve-trunk, in which the two sets of fibres are indistinguishable.

Spinaz'zola, a town of S. Italy, province of Bari delle Puglie, 28 miles N.N.W. of Potenza. It is well built, has six churches, and is the seat of an active district trade. Pop. (1874) 10,078.

Spin'dle Tree (*Euonymus*), a genus of about 40 species of trees or shrubs, natives of the mountainous regions of tropical Asia (27 in India) and the Malayan Archipelago—also a few scattered over Europe and N. America. The common S. T. (*E. Europæus*), a glabrous fetid shrub or tree of about five to twenty feet, with cymes of greenish-white flowers succeeded by a four-lobed pale crimson capsular fruit containing seeds with a bright red arillode, is the only British representative. Its light yellow, hard and tough but easily worked wood is used for skewers or pins and spindles, hence the name S. T. and Prickwood; it is also preferred as charcoal for crayons and the finer sorts of gunpowder. The root of *E. atropurpureus*, the burning bush S. T. of N. America, is used there as a diuretic in dropsy. The order *Celastraceæ*, to which the S. T. belongs, consists of about 400 species.

Spine, Spi'nal Col'umn, Ver'tebral Col'umn, or Back-bone', is the chain of bones (*vertebræ*) in the dorsal or back region of *Vertebrate* animals. In some fishes (*e.g.*, lancelet, lepidosiren, &c.) the place of the spine is occupied by the *Notochord* (q. v.). In man the spine is composed of thirty-three bones, five of these fusing to form the *sacrum*, and four to form the *coccyx*. In mammals this number is usually exceeded. The various regions into which the spine may be divided are the *cervical* (neck), *dorsal* (back), *lumbar* (loins), *sacral*, and *caudal* (*coccygeal* in man) or tail. Each of the joints or *vertebræ* of the spine consists of a body and processes, and by their apposition they form the bony canal in which the *spinal cord* is protected. The *cervical* vertebræ, or those of the neck, number seven in man and in all quadrupeds save the three-toed sloth, which has nine vertebræ, and Hoffman's sloth and the manatee, which have six. The first cervical vertebra supports the head, and is called the *atlas*, the second being the *axis*. The *dorsal* or back vertebræ in man number twelve, and bear the ribs; those of the loins five; while, as already remarked, the sacrum includes five and the coccyx four modified vertebræ. The human spine attains an average length of 28 inches. It is widest at the base of the sacrum, and diminishes in calibre both upwards and downwards from that point. The hinder aspect of the S. shows a row of the prominent *spinous processes* of the vertebræ, its front aspect being smooth and convex. Two series of curves are seen in man's spine; these are respectively named *antero-posterior* and *lateral*. At birth the spine exhibits a concavity forwards in the sacral region, but is well-nigh straight elsewhere. A convexity forwards soon appears in the neck, and a similar curve appears in the loins. In man's spine alone do the lumbar vertebræ curve forwards. A lateral curve, convex to the right side, is observable in man's spine, opposite the third, fourth, and fifth dorsal vertebræ, and a compensating curve, convex to the left, occurs below and above this point. These curves are due to the greater use of the right arm over the left. The spine is the great centre or keel, so to speak, of the body, and serves not merely to support the head, but to give attachment to the limbs, and also as a point of attachment of many important muscles.

Diseases of the S.—Caries of the S. is of very frequent occurrence among strumous, delicate children, generally arising spontaneously, but frequently ascribed to slight accidents as its cause. The disease is identical with Caries (q. v.) in the osseous structure, but its symptoms are modified by the seat of the disease. Caries may affect any part of the S.; but it is more dangerous in the higher than in the lower part of the column.

The earliest symptoms of caries of the spine are pain in the back increased by movement and percussion, and confined to a fixed spot in the spinal column. Sometimes there is thickening or even increased temperature around the diseased bones. The affected part is kept rigid, and the attitude is characteristic when the disease is situated in the upper part of the neck. When abscess is perceptible, or when curvature exists, the diagnosis is obvious. In many cases of caries the inspissated remains of pus may be found; but in some cases the softened bone seems to have been absorbed without the formation of pus. Caries of the cervical portion is a more dangerous affection than caries of the lumbar or dorsal regions, and it usually at first simulates mere 'stiff-neck,' but in such cases often a slight tap on the head will produce pain. There is usually thickening around the affected vertebræ, often sinuses about the neck, and frequently post pharyngeal abscess, but very rarely curvature. The chief danger consists in softening of the cord, and in displacement of the odontoid process in disease of the two upper vertebræ, which by impinging on the medulla oblongata may produce instant death. When this portion of the spine is affected, the most rigid rest must be insisted on, and the head and neck ought to be confined in a case of guttapercha.

In *lateral* curvature of the S. the distortion is not usually confined to one side, but each vertebra is also somewhat rotated on that next to it, and the distortion is sometimes called 'rotation-curvature.' This lateral curvature is obviously in great measure caused by the action of the muscles inserted on the vertebræ. It is most frequently met with among delicate girls about the period of puberty, and anything which produces habitual inclination of the spine to one side may prove the starting-point to the deformity. Lateral curvature in the dorsal region causes a displacement of the ribs and scapula upwards on the convex side of the curve, raising that shoulder higher than the other. The thorax may be greatly altered in shape, the ribs being flattened, the intercostal spaces nearly obliterated, and the cavity of the lung greatly

narrowed, the reverse being the case on the upper side. In lateral curvature of the lumbar region, the distance between the last rib and the ilium is much increased on the convex side, while on the concave side the rib may impinge on the ilium. The hip is also raised, and prominent on the convex side of the curve.

The other curvatures of the spine are kyphosis and lordosis. The term *kyphosis* is sometimes applied to all antero-posterior displacements. This curve is common in weakly children and in old people, and in early infancy it occurs from mere relaxation. The kyphosis of old age is also due to relaxation, and can hardly be mistaken. *Lordosis*, or saddleback, is caused chiefly by disease, or congenital dislocation of the hip, the backward displacement of the centre of gravity of the body and the forward inclination of the pelvis being caused by the dislocation. Ankylosis of the spine is common in old age, and is frequently associated with chronic rheumatic arthritis.

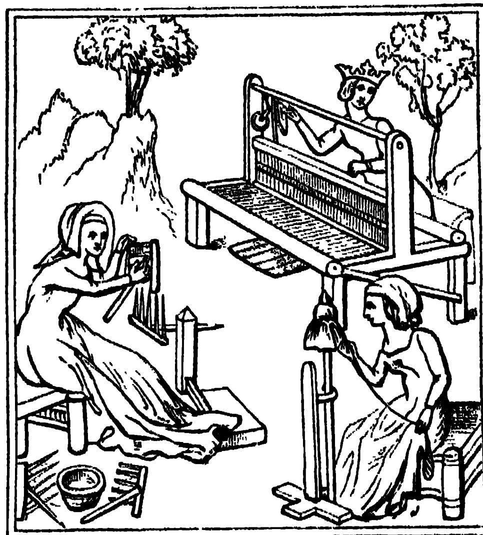
Treatment.—Dr. Lewis A. Sayre of New York has recently introduced a new method for the cure of curvature of the spine, which has been more successful than any other mode previously introduced. The clothing being removed, a thin closely woven vest without armlets is put on next the skin, and a large pad is placed over the abdomen under the vest. The child is then placed under a tripod stand, to the apex of which is attached a block-and-fall arrangement carrying a horizontal iron bar. A padded collar is then buckled round the head and chin, and padded stirrups are passed under the arms. Straps are then passed separately from the collar and arm stirrups to the iron bar above. By adjusting these straps the relative tension upon the head and arms is secured, and when thus suspended the spine becomes much straighter, and the diseased surfaces of the vertebræ are prevented from pressing upon one another. The patient is then directed to make a few deep inspirations. Plaster-of-Paris bandages are then applied round the body from the pelvis to the arms, and strips of thin perforated tin are placed by the sides of the spine, and a second layer of plaster bandages passed round the whole. The straps are then removed, the patient placed upon a mattress, and as soon as the case is dry the abdominal pad is withdrawn. In cases of caries of the cervical region a head-piece is adjusted to the body-case, by means of which the spine may be relieved of the weight of the head. In both forms of the disease, angular and lateral, after treatment by suspension and fixation, free exercise is allowed. After two or three months the case may be slit down the front and fastened with eyelits. See Sayre's *Lectures on Orthopedic Surgery* (Lond. 1876); *Medical Journal of Richmond and Louisville* (May 1877); the *American Practitioner* (June 1877); and Sayre's *Spinal Diseases and Curvature* (Lond. 1877).

Spine, or **Thorn**, in botany, is strictly the strongly pointed extremity of a branch or abortive petiole or peduncle. When stipules (as in *Robinia*), or the teeth of a leaf (as holly and thistle), or leaves (as in gooseberry and furze), or the involucre (as in some *Centauriæ*), or seed-vessels (as in *Medicago*), bear spines, the term spinous as applied to these parts is used in a more conventional sense than indicated above.

Spin'el, a mineral species which embraces the various forms of the much prized Ruby (q. v.). In addition to these varieties, S. includes stones of different colours, blue, green, yellow, brown, and black, and from being a compound of alumina and magnesia with a little iron, it passes into combinations in which iron, manganese, and lime or zinc largely or altogether supplant the magnesia.

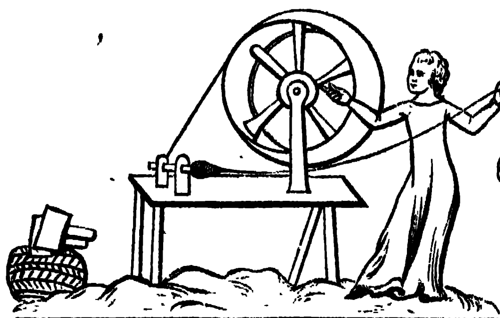
Spin'et, or **Couched Harp** (Ger. *spinett*, Ital. *spinetta*), a keyed musical instrument, closely resembling the virginal, but differing from the older virginals in being always triangular in shape. The strings, one of which went to each note, were set in vibration by jacks or quill plectra. The S. was the precursor of the harpsichord.

Spin'ning. The art of twisting fibres into a continuous thread or line being a fundamental operation in textile industries, the process of S. by which that is accomplished, is, as may be readily imagined, one of extreme antiquity. Abundant testimony is borne to this fact not only by the works of the most ancient writers, but also by the remains of S. whorls of stone and baked clay, and of woven fabrics themselves, found in prehistoric deposits. The implements used in connection with the art of S. from the earliest times, and throughout many ages, were of the simplest nature, and the occupation it afforded was entirely domestic and prosecuted by the women of the household. The S. implements were the distaff and the spindle, the former being merely a bar or short stick of wood, to the top of which the material to be spun was loosely attached, generally by being wrapped up as a soft ball into which the end of the distaff was inserted. The distaff was held under the left arm of the spinner, and with the right hand she drew out a uniform sliver of the fibre which was twisted by and wound on the spindle. In some cases the distaff was placed in an upright stand, as seen in the accompanying figure, extracted from a 15th c. MS., in



Textile Fabrics.

which the operations of S. and weaving are illustrated. The spindle was a stick 10 or 12 inches long, having at the top a slit or catch in which the thread was fixed, and as a makeweight on its lower end there was placed a stone whorl. The spindle was rotated with the right hand, and by its rotation and weight the thread was at once drawn out and twisted, and whenever it reached the ground the thread was lifted out of the slit, wound on the body of the spindle, and the operation again renewed. The use of these exceedingly simple implements continued till comparatively recent times, and the various forms of S. wheels did not altogether supplant them. From the illuminated MS. of the 14th c. in the British Museum, it is obvious that a kind of S. wheel was in use as early as that date. The wheel there illustrated (fig. 2) was only employed to turn a simple spindle

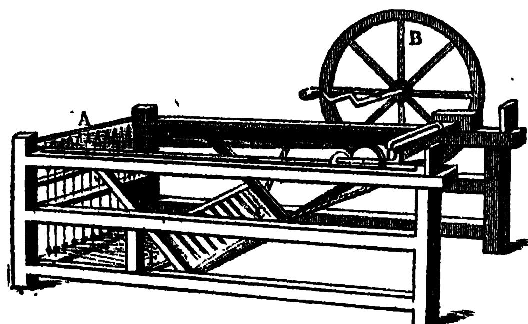


Textile Fabrics. (Fig. 2.)

mounted horizontally. The worker gave the wheel a violent turn with the hand, and then rushed backward, drawing out thread as long as the motion of the wheel kept up. In the improved forms of S. wheels which were to be seen in every rural household in Scotland throughout the earlier part of the present century, the wheel was rotated by the feet, thus leaving both the worker's hands free to attend to the S. operations, and generally in the wheel two separate spindles were mounted and worked simultaneously. The distaff or 'rock' was fixed on the wheel

frame, and the S. appliances consisted of a flyer and a bobbin or pirn, both mounted on the same spindle, the flyer consisting of two arms, which by their rotation twisted the thread and thereafter fed it on to the bobbin revolving within the arms.

A great revolution in the S. industry had its origin in the invention of the S.-jenny by Hargreaves about the year 1764.



Hargreaves' Jenny.

The S.-jenny consisted of a frame in which a series of erect spindles were placed, each of which spun and wound on itself a thread from separate bobbins of 'roving' or loose fibre mounted in a movable carriage, which in its motion away from the spindles drew out the fibre to the requisite degree of tenuity, which then were twisted and wound on the spindles as the carriane moved towards them. With the aid of this apparatus a single attendant was enabled to spin a number of threads in one operation. About the same period the still more famous water-twist frame of Arkwright was invented, an apparatus in which the fibres were drawn out to the requisite degree of tenuity by being passed between three successive pairs of rollers, each succeeding pair revolving with greater rapidity than those preceding them. This device, which is the most valuable of all the inventions which have ever been applied in the art of S., had originally been proposed and patented by Paul of Birmingham in 1738, but it was entirely lost sight of till rediscovered and practically introduced by Arkwright. From the drawing rollers in Arkwright's frame the attenuated fibre was led through eyelet hooks direct to the spindle flyers arranged in a slanting position on a horizontal bar, and, being twisted, the yarn was wound on a bobbin revolving within the flyer arms. Thus in Arkwright's frame the operation of S. was continuous and uninterrupted. In 1779 Crompton elaborated his mule, an apparatus so named on account of its combining in one the essential features of both Hargreaves' and Arkwright's machines, and in this combination are found the essential features of the modern S. frame. In the mule the successive pairs of drawing-rollers are employed, and in addition the drawn fibres are run out by a movable carriage, on which the spindles are arranged. When the carriage reaches the end of its course, the rollers cease to revolve, and as it runs in towards the rollers the spindles both twist and wind up the yarn twisted. It will thus be seen that the motion in the mule is, as was the case with Hargreaves' jenny, of the intermittent nature.

In a modern S.-mill all the range of operations from the raw fibre up to the yarn ready for weaving, knitting, or thread manufacture are embraced, and while the mechanical principles involved in the actual S. machines are the same, the range of processes and appliances required for flax, cotton, long and short wool, and indeed for most fibres, is wide and distinct from each other. In all cases the objects to be attained are to arrange the fibres parallel to each other, to draw them out into a continuous untwisted or lightly twisted cord or 'sliver' of uniform thickness, and finally to twist the yarn in an even and equal manner. The various forms of machine devoted to these purposes have now been brought to a state of extraordinary perfection, and the most delicate operations are performed with so great certainty by automatic machinery, that only the attendance of unskilled girls is required. See COTTON-SPINNING, and WOOLLEN AND WORSTED MANUFACTURE.

Spino'za, Baruch or **Benedictus de**, one of the greatest of modern philosophers, was born of Jewish parents at Amsterdam, 24th November 1632. He was at first educated for the Jewish priesthood, but his inquiring mind soon becoming dissatisfied with the doctrines of Judaism, he left the synagogue, from which, moreover, he was formally expelled by excommunication, and devoted himself to the study of philosophy. When twenty-eight years of age he left Amsterdam, and, after a brief residence at various places in Holland, finally settled at the Hague, where he earned his living by polishing optical glasses. He died 21st February 1677.

The chief works of S. are his *Ethica*, which contains his system of philosophy, presented in the form of geometrical demonstration; his *Tractatus Theologico-politicus*; a treatise on the interpretation of the Bible; and his *Tractatus Politicus* on government. S.'s system is a development and completion of that of Descartes. That philosopher defined substance to be 'that which for its existence stands in need of nothing else.' 'Then,' says S., 'there can only be one substance.' Here already he separates himself from his master. 'It must be absolutely infinite, and not only contain the last grounds of all existence, but must be All: this substance, infinite and eternal, is God.' Thus his philosophy assumes a Pantheistic form. All the (apparently various) forms of being are but the modes in which God's existence is manifested. Of these modes all that are known to us belong to two attributes of substance, thought and matter. These *modi*, as S. named the attributes, have no independent existence; though in one sense different, yet they are but different manifestations of the same substance. They are the special individual forms which constitute the universe as we know it, and are changeable and finite though the substance of which they are manifestations is unchangeable and infinite. They are related to it as the waves to the ocean. All their motions are absolutely necessary, and thus there is no free will. From this point of view the union of mind and body, which had been such a stumbling-block to the followers of Descartes, was easily explained, for their movements must correspond, since they were really movements of what was ultimately one and the same substance. In the more properly ethical part of S.'s philosophy we have the practical consequences of this system. There being no free will, men only believe they are free 'because they are conscious of their own acts, but not of the motives of them.' Good and bad are only relative, for God being all in all, nothing is really bad. The highest duty and highest good for man is one—to know and love God. Thus we learn the eternal fitness and necessity of all things, and are raised as on a rock from out the wild sea of vain human passion, and that state is the only true happiness. 'Felicity is not the reward of virtue; it is virtue itself.' In the *Tractatus Theologico-politicus* S. distinguishes between philosophy and religion—the former has for its object the discovery of intellectual truth, the latter is concerned with life and conduct. The Bible 'pretends not to reveal natural laws, but to exhibit laws of ethics.' Christ is undoubtedly the centre figure of the whole book, for he found the revelation of God in his own consciousness, and did not seek it, as Moses did, from an external source, and from this point of view only can we affirm that the Divine Word became man. But there is a distinction to be drawn between the moral truth of the Bible and the historical vehicle (viz., the various books) in which it is conveyed. These are proper subjects for historical criticism, which, assured that no imperfections in *them* can injure the moral truth they contain, must treat them on exactly the same principles as it would any other writings. Thus there must be in religious matters liberty to think and express what a man really believes; and in politics (such is the argument of the *Tractatus Politicus*), as far as regards thought at least, the rule of liberty also applies, for rulers 'are to bring the actions but not the convictions of men into harmony.' A republic, aristocratic in form, but with an admixture of the popular element, is the best form of government.

S.'s influence on later German philosophers, especially on Schelling and Hegel (q. v.), has been very great, and through his *Tractatus Theologico-politicus* he is the founder of that school of Rationalistic theology which has so long ruled the German Protestant Church, and which in our own time has had such a powerful and far-reaching influence. His character is perhaps still more remarkable than his works. He was absolutely indifferent to wealth, fame, or power. He steadily turned aside from everything that could in any way interfere with his freedom of thought. He was cheerful and contented while afflicted with great bodily weakness and in the midst of extreme poverty. Philosophy has no record of a purer life or a more elevated cha-

racter. The complete works of S. were edited by Paulus (Jena 1802-3), Gröfrer (Stuttg. 1830), C. H. Bruder (Leip. 1843-46). See also the German translation by B. Auerbach (5 vols. Stuttg. 1841), and the French translations by E. Saisset and J. G. Prat (Par. 1861 and 1863). In English the completest work on the subject is *Benedictus de S.*, by Dr. R. Wills (Trübner, Lond. 1870). For briefer accounts the reader may be referred to the Histories of Philosophy by Lewes, Schwegler, and Ueberweg.

Spiræ'a, a genus of *Rosaceæ*, numbering about 50 species of perennial shrubs, and distributed over the temperate and cold regions of the N. hemisphere. *S. ulmaria*—the meadow-sweet—is a common British representative. *S. filipendula*, a plant of dry pastures, is much less common. Several of the shrubby species are grown as garden and shrubbery ornaments, such as *S. salicifolia*, a European species now semi-naturalised in Britain; *S. bella* from Nepal, with rose-coloured flowers; *S. tomentosa*, the 'hard-hack' of N. America; *S. Fortunei* from China; the chaste *S. prunifolia* from Japan, and many others.

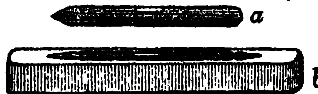
Spi'ral is a plane curve traced out by a point which moves along a line according to a fixed law, while that line rotates uniformly round a point in itself. To take the simplest case, the S. of Archimedes, suppose the point to move uniformly along the line. Then evidently the rate of increase of the radius vector is proportional to the rate of increase of the angle it makes with a fixed line, since both rates are constant; and hence, if both angle and radius start from zero, the length of radius is proportional to the size of angle. Consequently the polar equation may be written $\rho = a\theta$, where ρ and θ are the polar co-ordinates and a a constant. The general equation $\rho = a\theta^n$ includes this and the hyperbolic and parabolic spirals, whose equations are respectively $\rho = a\theta^{-1}$ and $\rho = a\theta^2$. The logarithmic S. is noted under LOGARITHM. See Salmon's *Higher Plane Curves*.

Spires, the slender, tapering superstructures of church towers, which, having their origin in the low pyramidal roofs—square, circular, or octagonal—of Norman turrets, and in Early English growing more lofty and acute, attained their perfection in the Decorated and Perpendicular styles, where they have gutters and parapets round their bases, and are enriched with crockets, pinnacles, niches, canopies, &c. Upon the Continent open-work S. are not unfrequent, and there the loftiest S. are those of Strassburg Cathedral (completed in 1439), 494 feet; Rouen Cathedral (1876), 487½ feet; St. Nicholas, Hamburg (1874), 486 feet; St. Martin's Landshut (1580), 468 feet; and St. Stephen's, Vienna (1864), 452 feet. In England we have the S. of Salisbury Cathedral (*circa* 1350), 404 feet; of Norwich (1361), 309 feet; and of St. Michael's, Coventry (*circa* 1380), 303 feet. In Scotland, Glasgow Cathedral (1195-1250) has a spire 225 feet high; and St. Mary's Cathedral, Edinburgh (1878), one of 275 feet. S. are usually of stone, but that of Rouen is of cast-iron, and timber covered with lead or shingles is also used. The spire and tower together are called a *steeple*.

Spir'it, or **Spirits**, a name which originated during the time of the alchemists, and which was applied to volatile fluid substances obtained by distillation. In this way we have still the names S. of turpentine, S. of salt, S. of hartshorn, and S. of wine, &c., but the term is now usually restricted to the various forms of distilled alcohol and its preparations for various purposes. The term thus includes the various forms of alcohol used for drinking—brandy, gin, rum, whisky, &c., the S. of the pharmacopœia, and those employed for industrial purposes. See METHYLATED SPIRIT, and FERMENTED AND DISTILLED DRINK, CONSUMPTION OF.

Spir'it Duck. See GARROT.

Spir'it Level. A S. L. consists essentially of a hermetically sealed slightly-curved glass tube (fig. *a*) nearly filled with alcohol, and containing a small bubble of air, which exactly occupies the middle point when the tube is perfectly horizontal. The tube is commonly mounted in a case of wood, faced with brass (fig. *b*), which is laid on the surface to be tested. Telescopes, theodolites, and other instruments of precision are provided with spirit levels.



Spirit Level.

Spir'itualism, or **Spir'itism**, as it might perhaps be more conveniently called, so as to distinguish it from the set of philosophical tenets to which the longer name has already been appropriated, is in its present development a species of religious belief, grounded upon the theory that certain physical and mental phenomena, alleged to be inexplicable under the laws of nature as at present understood, are the result of the direct intervention of incorporeal spirits. The phenomena in question are of every possible description, from old-fashioned 'second-sight' apparitions, through all the modern refinements of rapping, writing, and verse-making spirits, down to the latest phase of 'materialised spirit forms,' which can be felt, embraced, and even photographed. They are, indeed, so widespread and various that we cannot here attempt more than a sketch of their history, and a reference to a few of the very numerous works in which detailed descriptions and criticisms of them will be found.

The Hydesville rappings of 1848 are usually looked upon as the commencement of modern S. So, in a sense, they were; but Mr. W. Howitt, in his *History of the Supernatural in all Ages and Nations* (Lond. 1863), has proved that very similar phenomena, even in the detail of communication by rapping, were claimed to have taken place in Germany and elsewhere more than half a century earlier, the most notable case being that of the Seeress of Prevorst, minutely described by the well-known physician and poet, Dr. Kerner. Mr. Howitt's work is ill-arranged and feeble in argument, but is a rich storehouse of traditions and anecdotes bearing on the question of the possibility of spirit-communication. In R. Dale Owen's *Footfalls on the Boundaries of Another World* (Phil. 1860), there is also abundant proof that the alleged phenomena are far from being so entirely novel as is sometimes supposed, his account of the disturbances at Mr. Mompesson's house at Tedworth in 1661-63, and of the still more famous rappings in the Wesleys' home at Epworth Parsonage in 1716-17, being especially interesting. Nevertheless, S. in its modern form may be said to have originated at Hydesville, a village in the State of New York, U.S. Here, in 1848, lived a family named Fox, consisting of a father, mother, and two daughters—Margaretta and Catherine, aged respectively twelve and nine. For some months they had been annoyed by repeated and inexplicable knockings in the walls and furniture of their cottage. At last, on the night of the 31st of March, the little girl Kate happened to notice that the rappings seemed to reply to any noises made by the members of the family. 'Do as I do,' she said, snapping her fingers, and instantly the sounds responded. 'Count ten,' she said, and ten raps were given. 'How old is Margaret?' asked the mother, and twelve raps followed. 'And how old is Kate?'—nine raps. From these hints a system of communication was elaborated by which words were spelt out and questions were answered. Meanwhile the rappings went on vigorously. Miss Kate Fox, in whose presence they were strongest and most frequent, was sent on a visit to a married sister in Rochester; there the rappings followed her, though they did not cease at Hydesville, and several other families began to be disturbed by them. At length, on the 14th of November 1848, a public lecture was delivered on the subject, at which specimens of the rappings were given. The newspapers took up the matter, and spread the knowledge of it throughout the country. Persons in all parts of the States began to develop 'mediumistic' power, as it soon came to be called, and by 1850 S. had become a recognised institution throughout America, and began to be heard of, principally in the way of ridicule, in England and on the Continent. The way had been prepared for it in America by the mystical writings and addresses of Andrew Jackson Davis, 'the Poughkeepsie Seer,' which, under such titles as *The Principles of Nature*, *The Great Harmonia*, *The Magic Staff*, *&c.*, had obtained considerable currency. (For an account of these see *Edinburgh Review*, October 1865.) Gradually the doctrine attracted more and more attention. The Hon. John W. Edmonds, a judge of the New York Court of Appeals, and Robert Hare, M.D., Professor of Chemistry in the University of Pennsylvania, both undertook to investigate the matter and expose its delusions, and both ended by admitting their conviction of the genuineness of the facts; the former in his *S.* (10th ed. New York, 1854-55), and the latter in his *Experimental Investigation of the Spirit Manifestations* (5th ed. New York, 1858). Such men, too, as Horace Greeley and N. P. Tallmadge, governor of Wisconsin, bore testimony to the genuineness of some, at least, of the manifestations, which

assumed all forms, from the ordinary furniture-moving phenomena to clairvoyance, spirit-writing and drawing, playing on musical instruments, 'levitation' of the human body, untying of complicated rope-knottings, and even 'materialisation' or assumption of a tangible spirit-body. So early as 1852 a paper called the *Spiritual Telegraph* was published in New York, and in 1854 a 'Society for the Diffusion of Spiritual Knowledge' was founded in the same city. The American literature of S. is now enormous. The chief periodicals devoted to the subject are the Boston *Banner of Light* and the Chicago *Religio-Philosophic Journal.* But there are, or were until recently, other spiritual papers and magazines in Boston, New York, Philadelphia, New Orleans, San Francisco, Utica, N.Y., Springfield, and indeed in almost every city of any importance. The number of believers in S. in America was estimated by competent authorities in 1871 at about eleven millions; there were 125 Spiritualist societies and 207 professional lecturers. The leading American works on the subject, besides those already cited, are Adin Ballou's *Spirit Manifestations* (Liverpool 1853); E. W. Capren's *Modern S., its Facts and Fanaticisms* (Boston 1855); Hudson Tuttle's *Scenes in the Spirit World* (New York 1855); and his *Arcana of S.* (Lond. 1876); Judge Edmond's *Spiritual Tracts* (New York 1858-60); R. Dale Owen's *The Debateable Land between this World and the Next* (Lond. 1871); Olcott's *People from the Other World* (Hartf. 1875); N. B. Wolfe's *Startling Facts in Modern S.* (Cincinnati 1874); Epes Sargent's *Planchette, the Despair of Science* (Bost. 1869), and *Proof Palpable of Immortality* (Bost. 1875); and, most important of all, the voluminous but crude and incongest *History of Modern American S.* by Emma Hardinge (New York 1870).

One of the earliest Spiritualists who visited England was a Mrs. Hayden, who gave seances in London in 1853, but it was not until the arrival of Mr. Daniel Dunglass Home, in 1855, that the 'movement' began to excite general attention. This famous medium was born in Scotland in 1833, but went to America when a mere child. His specialty lay in the unusual strength of his manifestations, which were for the most part of the ordinary kind, such as rapping, turning and raising tables, &c., though he was now and then 'levitated,' *i.e.*, floated up to the ceiling, or out of the window and into the next room; and sometimes even elongated and contracted, it being on record that he at one time suddenly stretched to the height of nearly 7 feet, and then shrunk to several inches below his natural stature. Very soon after his arrival he was visited by Lord Brougham and Sir David Brewster, who seem to have been puzzled by his performance, but by no means converted. S., however, was gaining ground rapidly. Among its first converts was the venerable Robert Owen, whose son was afterwards one of its leading exponents. The eminent mathematician and logician, Professor De Morgan, was also an early adherent of the new doctrine, and published in conjunction with his wife a treatise called *From Matter to Spirit* (Lond. 1863). Many, on the other hand, adopted the theory that S. was an ingenious invention of the devil for the perversion of humanity, one of the most notable expositions of this view being the Rev. R. W. Dibdin's *Table-Turning* (Lond. 1853). Faraday attempted to explain table-turning by a theory of unconscious muscular action, which unfortunately was at best only applicable to a very small class of the alleged phenomena. On the Continent the question was discussed in De Gasparin's treatise *Des Tables Tournantes* (Par. 1854), and in a less scientific and more mystical spirit by the Marquis de Mirville in his voluminous *Pneumatologie* (Par. 1858). Home was meanwhile wandering through Europe, received with distinction at the courts of Paris, Berlin, and St. Petersburg, and making many converts, especially in the upper ranks of society. He it was who brought the subject under the notice of R. Dale Owen, then American minister at the court of Naples. For the rest of this gentleman's adventurous career, reference may be made to his autobiography, entitled *Incidents of my Life* (two series, Lond. 1863-72). In 1864 the famous Davenport Brothers paid their first visit to England. Born at Buffalo, New York, in 1839 and 1841 respectively, Ira and William Davenport had long been famous in the United States. In Europe they created a great sensation, and gave rise to endless controversy. They were exposed, vindicated, and re-exposed time after time, and their rope trick and cabinet performance have given the suggestion to all the most elaborate exhibitions of our modern conjurors. The years 1869-70 may be taken as a new point of departure in the history of S., as about this time the first genuinely-scientific researches into the subject were set on foot. In 1869 the London Dialectical Society appointed a large committee to examine into the phenomena, and from the *Report* which it published (Lond. 1871) it appears that its members were thoroughly convinced of the genuineness of many of the alleged manifestations, though the question of their spiritual origin was of course left entirely open. About this time, too, Mr. William Crookes, F.R.S., discoverer of the metal thallium, and editor of the *Quarterly Journal of Science*, undertook an independent investigation of the subject, Mr. Home and Miss Kate Fox (now Mrs. Jencken) being the mediums with whom most of his experiments were conducted. His researches, carried on in the most scientific spirit, led him first to the conclusion that a hitherto undiscovered force must exist, which he proposed to designate *psychic force*—a term also adopted by Serjeant Cox in his *S. Answered by Science* (2d. ed. Lond. 1872), and ultimately led him to a thorough belief in the Spiritual theory. His pamphlets, entitled *Psychic Force* and *Modern S.* (Lond. 1871-72-74), are certainly among the most valuable of extant works on the question. Mr. Alfred Russel Wallace, the well-known traveller and naturalist, looks at the question from a more *à priori* point of view in his *Scientific Aspects of the Supernatural* (Lond. 1866), enlarged into his *Miracles and Modern S.* (Lond. 1875). The latter is, however, by far the best popular discussion of the subject as yet published. In 1876 occurred the second Spiritualist *cause célèbre.* Dr. Slade, an American medium professing to obtain spirit-messages written on the surface of a slate held close against the lower side of an ordinary deal table, was prosecuted under the Vagrancy Act, at the instance of Professor Lankester and Dr. Donkin, who alleged that they had snatched the slate from his hand before it was placed under the table at all, and had found the writing already on it. The evidence was very extraordinary and conflicting, but the medium was ultimately sentenced to three months' imprisonment. On appeal, however, he was acquitted on a point of law, and had disappeared before a new warrant could be taken out against him. The most recent and most advanced forms of Spiritual manifestations are of the nature of 'materialisation,' with its concomitant 'spirit-photography.' Abundant accounts of these developments are to be found in the Spiritual periodicals, the *Medium and Daybreak* and the *Spiritualist* (weekly), and the *Spiritual Magazine* (ceased 1877) and *Human Nature* (monthly), all published in London. Among the more recent literature of the question in England may be noted Gerald Massey's *Concerning S.* (Lond. 1876); Maskelyne's *S., an Account of its Rise and Progress* (Lond. 1876); a flippant criticism of the movement by one of the clever firm of conjurors who for some years have carried on so-called *exposés* of S. at the Egyptian Hall, London; D. D. Home's *Lights and Shadows of S.* (Lond. 1877); and a work entitled *Psychography*, by 'M.A., Oxon' (Lond. 1878). On the Continent the most voluminous writer on S. is M. Léon H. D. Rivail, who under the name of 'Allan Kardec' has published a complete mystic system based upon S., which is, however, regarded by most English spiritualists as heterodox, except on the practical subject of mediumistic methods, &c. An English translation of his works is being carried out by Miss A. Blackwell, two volumes being already published, viz., *Experimental Spiritism* (Lond. 1876), and *Practical Spiritism* (Lond. 1878). To indicate the extent to which spiritualist doctrines are spread throughout the world, we may give the following statistics of spiritual periodicals:—In France there are at least 3; in Spain, 6; in Italy, 3; in Germany, 2; in Austro-Hungary, 3; in Belgium, 5; in Holland, 2; in Denmark, 1; in Switzerland, 1; in Turkey, 2; in Egypt, 1; in Mexico, 8; in Brazil, 4; in the Argentine Republic, 2; in Peru, Chili, Uruguay, and Columbia, 1 each; and 1 in Australia (Melbourne).

It will be noted that in the foregoing sketch we have merely stated facts and alleged facts, without discussing either their evidence or their intrinsic probability. The question is an extremely difficult one. A very slight acquaintance with the literature of S. is sufficient to create a hearty dislike for its general emptiness, aimlessness, and vulgarity. Exposures of trickery, too, have undoubtedly been numerous. On the other hand, many of the alleged facts are supported by evidence which, both as regards its quantity and its quality, it is extremely difficult to reject. The subject as a whole has not received

at the hands of modern scientists the treatment it deserves. Among the works almost essential to a thorough study of the question, especially in its relation to mesmerism, animal magnetism, and other kindred subjects, are: Ashburner's translation of Reichenbach's *Physico-Physiological Researches* (Lond. 1850–51); Gregory's *Abstract* of the same author's *Researches on Magnetism* (Lond. 1846); Bray's *On Force, its Mental and Moral Correlates* (Lond. 1866); Mayo's *On the Truths Contained in Popular Superstitions* (Edin. 1851); Serjeant Cox's *What am I?* (Lond. 1873); and *Mechanism of Man* (Lond. 1876); two articles in the *Quarterly Review*, understood to be by Dr. Carpenter, on *Electro-Biology and Mesmerism* (September 1853), and *S. and its Recent Converts* (October 1871); *Spirit-Rapping a Century Ago* in the *Fortnightly Review* (Feb. 1866), and an important article on *The Physics and Physiology of S.* in the *North American Review* (April 1870). On the supernatural in general, Mrs. Crowe's *Night Side of Nature* (Lond. 1848) and H. Welby's *Signs Before Death* (Lond. 1875) are useful collections of tales and legends. Zöllner's *Wissenschaftliche Abhandlungen* (2 vols. 1878) contains elaborate accounts of spiritualistic phenomena exhibited in the presence of Dr. Slade.

Spir'ula, a curious genus of cuttlefishes belonging to the *Dibranchiate* division of the Cephalopoda (q. v.), and distinguished by an internal chambered shell, the *septa* or partitions of which are perforated by a ventral tube or *ipuncle*. *S. Peronii* is the common species, the shells of which are cast up by thousands on the coasts of New Zealand, though, curiously enough, the living animal is rarely met with.

Spit'alfields, a parish of N.E. London, included in the Tower Hamlets, contains in its area of 73 acres 1966 houses, and a pop. (1871) of 20,783. The silk manufacture, established here by Huguenot refugees towards the close of the 17th c., has somewhat revived of recent years, but is now mainly confined to the production of rich furniture silks, both on the factory and home system, and velvets also are largely woven.

Spit'head, the famous English roadstead off the coast of Hampshire, forming the chief approach to Portsmouth and Southampton Water. It separates the Isle of Wight from the mainland in the E., and the corresponding channel on the W. is the Solent (q. v.), with a length of 14 miles, and an average breadth of 4; it is sheltered from all but south-easterly winds, and its security has procured it, among sailors, the name of 'the king's bedchamber.' Its proper name refers to the 'Spit' or sandbank which extends S. from the mainland for 3 miles. Its natural advantages for safe anchorage, and its vicinity to the great naval establishments of Portsmouth, have made it a favourite rendezvous of the British fleet, and consequently one of the most important points in the system of coast defence. Its fortification has been the subject of much care as well as controversy (see *Reports* of Commissioners on the Defence of the United Kingdom). It is now defended not only by the forts on the mainland and Isle of Wight, but by five iron-plated works, which are built from the bottom, and are among the most remarkable specimens of modern armoured fortifications. See IRON-PLATING.

Spitzberg'en (Russ. *Grumant*), a group of islands in the Arctic Sea, lying due N. of the North Cape between the parallels 176° 20′ and 80° 50′ N. lat. Altogether, according to Dunér and Nordenskjöld, they comprise an area of 22,844 sq. miles, of which S. proper contains 15,257. The larger islands have very broken coasts and deep fiords. The 'Ice Fiord,' along the shores of which rich coal-seams are found, affords a good anchorage for vessels. The interior is mountainous, attaining an elevation of 4100 feet, and covered with huge glaciers, whose lower fringes are washed by the waves. Here and there, during summer, exist patches of vegetation, mainly grasses, mosses, and lichens, affording pasturage to the reindeer, which abound. The polar bear, arctic fox, wild goose, eider duck, and other seafowl are in abundance, and the surrounding seas are rich in fish. Owing to the penetration of the Gulf Stream to these regions, the climate is not so rigorous as might be expected, the mean annual temperature being 16° F., or 16° below the freezing point of water. During the three summer months the mean temperature is about 37° F., and the maximum rarely reaches 60° F. S. was discovered in 1596 by the Dutch navigator Barents, who was searching for the N.-E. passage; and in the succeeding century the Dutch established in the north of the island a fishing station, Smeerenberg, which ceased to exist, however, when the whale-fisheries came to an end about 1820. Seal and walrus fishing are now carried on successfully by the Russians, and S. has recently acquired greater interest from the results of late scientific expeditions, and from the likelihood that it is the only possible path to the Pole. Numerous Swedish expeditions, from that of Otto Torell in 1861 to that of Nordenskjöld in 1873, have made the natural history of S. as well known as that of most European countries. Very important is the discovery of certain fossil plants in the Tertiary formations of S. that could not have grown under a climate less warm than that now found on the Mediterranean shores. S. was visited by Lord Dufferin in the *Foam* in 1867, and by the Dutch expedition in the *Willem Barents* in 1878.

Spleen, one of the abdominal *glands* at the left side of the body, close to the stomach and *pancreas*. It is somewhat oval-shaped and concave internally, where it is divided by a fissure named the *ilium*. Here bloodvessels enter and leave the organ, and the nerves also enter. The upper extremity of the S. is thick; the lower, which is in contact with the *colon* (see INTESTINE), is more pointed. The average length of the S. is 5 inches, its breadth 3 or 4 inches, and its thickness 1 or 1½ inches. Its weight is about 7 oz. The S. is a meshwork of fibres or *trabeculæ*, supporting a soft matter named the *S.-pulp*. Microscopically examined, the latter is found to consist of *blood-corpuscles* in a state of disintegration. The S.-substance also includes certain small round bodies, attached to the sheaths of the bloodvessels of the S., and named *Malpighian* or *splenic corpuscles*. During digestion the S. increases in size, but under starvation it decreases, and the Malpighian bodies disappear. The S. is supplied with blood by the *splenic artery*; its nerves are derived from the *right pneumogastric nerve*, and from the *left semilunar ganglia*. This organ may be excised from man and other animals without impairing the health, hence we may conclude that its functions are capable of being carried on by some other glands. In all probability the S. is one of the *blood-glands*, of which the *hymus* and *thyroid glands*, and indeed the whole *lymphatic system*, are examples. In the S. the blood-corpuscles undergo some changes; possibly the organ may be the seat of manufacture of red blood-corpuscles, as well as of their final disintegration.

Diseases of the S.—Most of the diseases of the S. occur as secondary affections in connection with other diseases, such as ague and leucocythæmia. *Amyloid* degeneration of the S. is frequently associated with a similar disease in the liver or kidneys. The S. is enlarged and increased in density, and it feels to the touch like wax. *Splenitis* or inflammation of the S. is rare in this country, but is common in tropical, malarial districts, and is usually associated with ague. The symptoms are pain in the left side, in the hypochondriac region, and considerable tumefaction. The hypertrophoid spleen may encroach on the stomach, and by upward pressure disturb the heart's action, or it may extend downwards into the pelvic region. The diffuse inflammation may terminate by resolution, but pus may form or the spleen may become gangrenous. Tumefaction generally subsides rapidly; but more or less hypertrophy may remain. Atrophy of the S. is a much less frequent affection.

Treatment.—Splenitis being generally associated with ague, disappears, as a rule, when the ague is cured. When the S. is chronically enlarged, it is best treated by the internal administration of the iodide of potassium, and by rubbing into the skin over the spleen the red oxide of mercury in the form of ointment.

Spleen'wort. See ASPLENIUM.

Splint, otherwise known as **Splent**, is an affection of the fore-leg of the horse. It consists of a bony enlargement between the knee and fetlock, which may affect one or both legs. The disease often appears in young horses which have been set to work at an early age, and which have especially been worked on hard roads. Cold-water bandaging is effective in its earlier stages combined with rest, and blistering or irritants must be resorted to thereafter to reduce the swelling.

Splint-bones, the rudimentary metacarpal and metatarsal bones in horses and other *Solipeda* or *Solidungula* (q. v.). They represent the beginnings of the second and fourth toes, which were fully represented in such ancestors of the Horse family as *Hipparion*, *Anchitherium*, *Orohippus*, &c.

Splints, in surgery, are mechanical appliances used to keep the fractured ends of bones as accurately as possible in position,

and immovable during the whole time of treatment. Ordinary S., used in fractures, are generally wooden, and are bought ready-made from the instrument-makers; but there are several kinds of S., the principal of which are the following:—*Gooch's splint*, composed of thin strips of light wood, bound together with a webbing. It easily adapts itself to convexities of the limb, and can readily be cut to any required length or shape; *pasteboard S.*, formed from pieces of pasteboard soaked in warm water; the *leather splint*, prepared by softening the leather in warm water, moulding it to the limb, trimming it with stout scissors, and applying it as the pasteboard splint; the *guttapercha splint*, similarly prepared; the *plaster-of-Paris splint*, thus made: One or two rollers of open material are charged with dry plaster-of-Paris by rubbing in as much as the bandage will hold, or the splint may be made of pieces of muslin or any open tissue similarly prepared with plaster-of-Paris. A layer of wadding or cotton wool being applied to the part, the bandage is placed in water for a very short time and is then applied, water being washed over each turn as it is being applied, and fresh plaster being rubbed over it as may be required. The plaster hardens very rapidly, and the splint is light. Others are the *Bavarian splint*, the *starch splint*, the *gum-and-chalk splint*. *Paraffin*, *silicate of potash*, and *glue* are also used in the formation of S. *Hides' patent felt splint* is made of felt lined with soft leather, and is hardened by a preparation sold with the felt and put on with a brush. There are also several S. used chiefly in cases of compound fracture, such as Macintyre's S., Liston's S., &c.

Splü'gen (Romaunsch *Speluga*), a village in the canton of Grisons, Switzerland, 32¾ miles S.S.W. of Coire, and 4757 feet above the sea, giving its name to the **S. Pass** (6945 feet high), which is on the Italian frontier, 4 miles south, beside the precipitous *Tambohorn* or *Schneehorn* (10,748 feet). In this pass General Macdonald, leading his division to the help of Brune (November 27–December 4, 1800), lost whole columns of men, hurled by avalanches into the abyss of the Cardinell. It was then but a bridle-path, but in 1818-22 an excellent road was made from S. to Chiavenna by the Austrian government.

Spohr, Ludwig, a celebrated musical composer and admirable violinist, was born at Seesen, in Brunswick, where his father was a physician, April 5, 1784. After receiving lessons on the violin from Maucourt, he appeared as a public performer at the age of twelve at Brunswick, when he played a concerto of his own composition. In 1802 his patron, the Duke of Brunswick, placed him under the instruction of Franz Eck, whom he accompanied on a visit to Russia. He was appointed in 1805 composer and conductor of concerts to the Duke of Sachsen-Koburg and Gotha, at whose court he remained for a number of years. He afterwards removed to Dresden, and was for a short time director of the music at the theatre at Frankfurt-on-the-Main till he was appointed chapel-master at Kassel in 1822. He made his first appearance in this country at the Philharmonic concerts in 1820. While he delighted Europe by his skill as a performer, he threw off multitudinous compositions of the most varied character—concertos, duets, trios, quartets, songs, &c., 6 operas, including *Zemire und Azor* (1819), *Jessonda* (1823), and *Faust* (1818), the last named a work which, if eclipsed in popularity by Gounod's masterpiece, abounds in fine and striking passages; 6 symphonies, including *Die Weihe der Töne*, and several oratorios of great excellence, including *Die Letzten Dinge* (1829), *Der Fall Babylons* (1840), and *Des Heilana's letzte Stunden* (1833). S. died October 22, 1859. He was a master of harmony, and his works are skilful, elaborate, and imaginative. His violin-playing was distinguished above all others for exquisite purity and delicacy of style; for refinement and polish more than for strength and passion. His Italian critics proclaimed him to be the first 'singer on the violin,' and he produced from its tones the deep and definite effects of the human voice. His *Violinschule* is one of the best books of instruction for the violin. His wife, Dorothea Schindler, was an accomplished harpist. See *The Autobiography of L. S.* (Eng. trans. 1864).

Spole'to, an ancient town of Central Italy, province of Umbria, lies on the slope of a hill, 41 miles S.E. of Perugia by rail. Outside the town is a deep ravine spanned by the imposing aqueduct Ponte delle Torri (604), which is used also as a bridge, and is built of brick resting on 10 arches, 290 feet high and 693 feet long. The principal buildings of S. are the cathedral of S. Maria Assunta, dating from 617, the churches of S. Domenico, S. Pietro, and the Palazzo Pubblico. Many Roman remains exist, of which the finest is an arched gateway called the Porta d'Annibale, or Porta della Fuga. S. manufactures woollens and hats. Pop. (1877) 20,791. S., the ancient *Spoletium*, became a Roman colony in 242 B.C., and repulsed Hannibal in 217. In 570 A.D. it became the capital of a Lombard duchy, and in 1220 was joined to the states of the Church. It fell into the hands of the Piedmontese, September 18, 1860, after a gallant defence by a body of Irish mercenaries in the Papal service, commanded by Major O'Reilly.

Sponge (*Spongida*), a horny substance valued for its ready imbibition of water, and consisting of the keratode skeleton of certain *Protozoa* (q. v.) or lowest animals. A S. is thus a colony of living animals. Such a colony communicates with the outer world by means of certain openings (capable of being closed at will), traceable in an ordinary S., and of which the larger are named *oscula* and the smaller *pores*. By the latter, currents of water are continually drawn into the S., while through the *oscula* currents are as continually discharged. These currents are kept up through the action of the minute vibratile processes named *cilia*, which are limited usually to certain spaces of the canals named *ciliated chambers*. The main use of this 'circulation in the S.' is evidently *nutritive*. Particles of food are thereby swept into the organism, whilst oxygen is also inhaled, and effete matters exhaled.

S.-reproduction is effected by means of specially developed masses of protoplasm named *spores*, which are formed in autumn, and which on liberation in spring are found to contain small reproductive particles, which after a free existence develop into S. *Sexual reproduction* is represented in S. by the union of certain cells representing *ova* or *eggs*, and other cells representing *spermatozoa*. After fecundation, a S.-egg undergoes the stages of segmentation common to the developing eggs of all animals, until the *morula* or *mulberry-stage* is reached. Thereafter the S.-egg becomes elongated and swims freely about in the water. An internal cavity is next formed, this cavity communicating by a mouth externally, and being bounded by two layers (*ectoderm* and *endoderm*). In this stage the young S. is a *gastrula*. Latterly, the outer cilia disappear, internal cilia are developed, and the S. ultimately fixes itself, and circulation is established. Sponges are classified either as the *Keratosa* (horny S.), *Silicea* (flinty S., *e.g.*, 'Venus' flower-basket,' or *Euplectella*) and *Calcarea* (*e.g.*, *Sycon*). A more philosophical arrangement divides the S.-class into families:—(1) *Fibrospongiæ* (fibrous S., including Silicea); (2) *Myxospongiæ* (*Halisarca*); *Calcispongiæ* (*e.g.*, Sycon and Calcareous S. generally). *Fossil sponges* are of frequent occurrence.

S. Trade.—The sponges of commerce come from the Eastern Mediterranean Sea and the West Indies. In the Archipelago, Crete, Cyprus, on the coasts of Asia Minor, Syria, Barbary, and the Bahama Islands, sponge fisheries constitute a very important industry. The finest sponges are obtained in Turkish waters. The fishing season commences in May, and closes in September or October. Diving is practised, and is carried on in a rude, primitive manner. The diver, who has no dress, seizes hold of a large stone to which a line is attached, and sinks by means of it to a depth varying from 30 to 180 feet. Keeping hold of the rope, he tears the sponge off the rocks within his reach, and places it in a net; when he has secured a netful he signals by means of the rope to be drawn up. A diver usually remains under water from 40 to 60 seconds. Formerly all the sponges gathered in the Archipelago were sent to Smyrna for transhipment to England and the Continent, but now many cases of sponge are shipped direct from the islands. The exports in 1876 from Rhodes and the Sporades amounted in value to £140,000, from the Cyclades £21,340, and from Smyrna £204,433. The fisheries of Cyprus in 1877 yielded 2500 okes (1 oke = 2·84 pounds avoir.), and the exports from Beyrout in the same year were valued at £8000. S. of a coarse texture and large honeycombing is found all along the coast of Tripoli and Tunis. The total exports from the regency of Tunis in 1875 were valued at £10,862, of which £1272 worth were unwashed. The value of sponges exported from Bengazi, Tripoli, amounted in 1876 to £55,000. The West Indian trade is annually increasing, and the fishing industry gives employment to 500

vessels and 2000 persons. The Bahamas and the coast of Florida are the fishing-grounds, and it is expected that Cuba will soon be added to them. The sponges are obtained by spearing with a pronged fork fixed to a long pole. 2899 cwts. of sponge, valued at £18,508, were exported to New York, Canada, and England from the Bahamas in 1877. The qualities most in demand were 'wool,' 'reef,' and 'velvet;' the other kinds go by the names of 'boat,' 'silk' or 'glove,' 'grass,' 'hardhead,' 'mixed,' 'yellow,' and 'refuse.' West Indian sponge is harsher, coarser, and less durable than its Mediterranean congener.

Sponge has many uses besides those of the household. It is indispensable to the surgeon; mattresses, &c., are stuffed with it; and it is also employed as a filter and as a polishing material for fine surfaces.

Spon'sors (Lat. 'promisers'). In the early Church, when the children of heathen parents were to be baptized, one or two persons were required to make a profession of the Christian faith on behalf of the children, and to become surety to the Church that they would be educated as Christians. Christian parents were properly the S. for their own children, but the practice was kept up of having other persons to act in this capacity. See GODFATHER.

Spontane'ity is the characteristic of an occasional act, immediately arising from the law of exercise for a mental or a bodily power. It has been simply defined as 'self-active causality.' In mind, the unexpected play of memory is said to be an instance of S., and the playfulness of a kitten is supposed to arise spontaneously from the vigour of its organism. Those, however, who believe in the mental S. defined above do not make sufficient allowance for the laws of association, and those who believe in physical S. do not, and indeed cannot yet, ascertain how much causality is to be attributed to obscure operations like reflex action and unconscious cerebration.

Sponta'neous Combus'tion, a very misleading term, differs from ordinary combustion in degree, not in kind. Combustion is the result of chemical combination of two or more substances, and is conditioned by the temperature, which varies for different combinations; and S. C. is simply combustion at ordinary temperatures. The same applies to the so-called S. C. of the human body, of over fifty recorded cases of which, according to Liebig, not one is well authenticated.

Spontoon' (Ital. *spuntone*, 'pointed'), an obsolete weapon resembling a partizan without its curved basal projections. It was carried till near the close of the 18th c. by English infantry officers who indicated commands, as 'advance,' 'retire,' 'halt,' by its motions.

Spool (Dutch, *spoel*, Ger. *spule*, 'a bobbin'), a hollow cylinder of wood or metal on which thread or yarn is wound.

Spoon (Old Eng. *spón*, a 'chip' or 'splinter' of wood), a familiar domestic implement used in carrying food to the mouth, and for other purposes. The earliest spoons were probably bivalve shells to which handles were attached for convenience. Many ancient Egyptian spoons of glass, wood, stone, and ivory preserve the primitive shell form. Horn was formerly a very common material for S.-making, and out of its use arose the proverb, 'To make a S. or spoil a horn,' signifying a determination to accomplish an object at any cost. German-silver spoons are now chiefly in use. They are stamped from sheet metal by means of 'punches' (having the outline of a S.) and 'bolsters' of steel worked by presses. In the subsequent operations the 'blank' is 'pippened,' filed, bowled, and set, and buffed or polished; better-class spoons are finished by electroplating, with silver or gold. Christening gifts in the Middle Ages took the form of *Apostle spoons*, so named because the stems bore figures of the Apostles.

Spoon'bill (*Platalea*), a genus of wading or *Grallatorial* birds, of which the *P. leucorodia*, or common white S., is the familiar species. This bird, which attains a length of about 30 inches, occurs but rarely in Britain, but is common on the European continent, and is also found in Asia and Africa. The bill is straight, flat, and very broad at its tip—hence the popular name. The colour is black, tinted with a rosy-pink, and the breast yellowish. The throat has a bare skin patch of yellow. The S. is common in Holland. They are members of the *Ardeidæ*, or Heron family, and feed on vegetable matters. The *P. ajaja* of S. America is another species, known from its plumage as the Roseate S.

Spor'ades. See ARCHIPELAGO, GREECE, and TURKEY.

Sporad'ic (Gr. 'scattered'), a term applied to solitary cases of disease, naturally epidemic or contagious, which are not prolific; thus single cases of such diseases as cholera, typhus fever, enteric fever, scarlatina, or measles, may occur without spreading in a district, and such cases are called S.

Spore in its widest sense is currently used to designate the reproductive bodies of Cryptogamia or acotyledonous plants. In by far the greater number of cases they are simple cells enclosed in a single or double cell-wall, and formed at particular places, very commonly in special receptacles to which the name *sporangia* is given. This is prominently the case in ferns where the sporangia are arranged in masses (called *sori*) at definite spots, usually on the under surface of the frond. The spores of ferns are asexual reproductive cells. So also are the spores of most other vascular cryptogams, and of fungi and Mosses (q. v.), also the 'tetraspores' of the red seaweeds. But the 'zygospores' and 'resting-spores' of other algæ are the result of a process of union, while the spores of the large brown or olive-coloured section are oospheres which require to be fertilised in order to enable them to germinate.

Spott'iswood, or **Spots'wood, John**, a Scottish ecclesiastic and author, belonged to an ancient family in the Merse. He was born in 1565 at Greenbank, near Midcalder, of which his father had been 'parson' since 1565, studied at the University of Glasgow, and succeeded his father at Calder at the age of eighteen. In 1601 he acted as chaplain to the Duke of Lennox's French embassy, and on the accession of James VI. to the English throne, he became a privy councillor and Archbishop of Glasgow. Twelve years afterwards he was made Scottish Primate in the see of St. Andrews. In 1618 he carried the famous 'Five Articles of Perth,' which committed Scotland to episcopacy. In 1633 he crowned Charles I. at Holyrood, and two years later he succeeded Lord Kinnoul as Chancellor of Scotland; but in 1639 the disturbed state of the country compelled his withdrawal to England, and he died at London, December 26, 1639. S. was the best scholar and historian of his day, but an arrogant, impolitic churchman, who lived to see the destruction of the ecclesiastical polity which he had so painfully built up. The only works of S. published in his lifetime is the *Refutatio Libelli de Regimine Ecclesiæ Scoticanæ* (Lond. 1620), a reply to the attacks of Calderwood. Four years after death appeared his valuable *History of the Church and State of Scotland, beginning the year of our Lord* 203, *and continued to the end of the Reign of James VI.* The S. Society republished the History in 1847–51 (3 vols.).

Spott'iswoode, William, LL.D., F.R.S., a living mathematician, was born at London, January 11, 1825. From Eton and Harrow he passed to Balliol College, Oxford, where he graduated in 1845, and subsequently gained two mathematical scholarships. On quitting Oxford he became manager of the business of the Queen's printer, devoting his leisure to the study of physical and mathematical science, to philosophy and Oriental languages. He is a member of many scientific societies, to whose transactions he has contributed papers of unquestioned ability. He was president of the British Association at the Dublin meeting of 1878, and succeeded Hooker as president of the Royal Society in November of the same year. He is author of *Elementary Theorems Relating to Determinants* (1851); *A Tarantasse Journey through Eastern Russia* (1857), and *Polarisation of Light* (1874, *Nature* series). See a Life of S. in the *University Magazine* (Dec. 1878).

Sprague, William Buell, D.D., was born at Andover, Connecticut, U.S., 16th October 1795, studied at Yale and Princeton, settled as pastor at W. Springfield in 1819, transferred to Albany, New York, in 1829, but in 1869 went to Flushing, Long Island, where he died 7th May 1876. S. wrote many evangelical sermons, &c. His chief work is *Annals of the American Pulpit* (1859–60).

Sprains are due to a violent stretching of tendinous or ligamentous parts, with or without rupture. S. of the back are very

common, and are caused by wrenches or contusions, producing violent fluxion of the whole column, the most common seat of the sprain being near the sacrum. There is stretching and probably more or less rupture of muscles, fasciæ, and ligaments on the posterior aspect of the spine. The symptoms are swelling, with subsequent inflammation, and great pain in moving, more especially in extending the spine. The treatment consists in subduing the inflammation by hot fomentations and leeches. Opiates should be given and perfect rest enjoined. When the acute symptoms disappear, the part may be fomented with poppy-heads, warm Goulard lotion, laudanum, or compresses of tincture of arnica may be applied. At a later stage friction and stimulating embrocations may be employed, and blistering or painting with iodine may relieve any remaining pain. S. of the joints of the lower extremity, especially of the ankle and knee, are very common, and when at the ankle it is sometimes difficult to decide whether there is fracture or not. Severe S. are generally followed by a good deal of effusion into the synovial cavity, and they often lay the foundation of permanent disease of the articulation. The treatment of all S. is conducted on the same principles.

Sprat, otherwise named the 'Garvie,' is the *Clupea sprattus* of naturalists—a Teleostean fish belonging to the section *Malacopteri*, and to the *Clupeidæ* or Herring family. This fish was formerly considered the young of the Herring (q. v.). A closer examination has served to show that it is specifically distinct. Thus the margin of the belly is distinctly serrated or notched, that of the herring smooth. The ventral fins of the S. are placed further forward than those of the herring, and commence at a point on the lower surface corresponding with the first ray of the dorsal fin on the back. There are also differences between the teeth of the S. and those of the herring. Sprats appear off the British coasts in immense shoals in winter and spring. They are captured in vast quantities, and form a cheap, nutritious, and palatable food. They are often used as manure in agricultural districts. An allied genus is the *C.* or *Harengulus latulus*, the 'Blanquette' of the French.

Spree, a river of N. Germany, rises at Ebersbach in the E. of Saxony, near the Bohemian border, flows N. into Prussia, expanding at times into marshy lakes, and passing Bautzen, Spremberg, Kottbus, Lübben, Beeskow, Fürstenwalde, Berlin, and Charlottenburg, and falls into the Havel at Spandau after a circuitous course of 221 miles. It is connected with the Oder by the Muilrose or Friedrich Wilhelm's Canal.

Spreng'er, Aloys, born at Nassereut, in Tirol, 3d September 1813; from 1832 studied medicine and Oriental languages at Vienna, and coming to London (1836), assisted the Earl of Munster in his *Military Science of the Mohammedan Nations.* In 1843 he sailed for India, and there promoted the establishment of Western culture as founder of a native press, as president of the College of Delhi (1845), as secretary to the Asiatic Society (1850), and in various other capacities. He returned to Europe (1857), and since 1858 has been honorary professor of Oriental Languages and Literature at Bonn. S. is author of an *Elementary Grammar of the English Language, explained in Urdu* (Delhi. 1845); *Das Leben und die Lehre des Mohammed* (3 vols. Berl. 1861–65), &c.

Spring is a mechanical contrivance which, by taking advantage of the elasticity of matter, stores up or transforms energy for a variety of useful ends. Thus the energy with which a railway carriage comes into collision with another is used up in compressing the S. of the buffer; the S. of a chair or sofa yields to the weight of the occupant, and in yielding calls into existence an equal and opposite force. Whenever work is spent in compressing, extending, or otherwise altering the form of a S., this energy can always be recovered (neglecting dissipation) by simply permitting the S. to regain its original form. The *S. balance* consists of a metallic helix, which, by the compression resulting from the weight of a body acting at its upper and free extremity, measures the weight of that body. It may be used for demonstrating the variation of gravity with latitude and height.

Spring-Beetles. See ELATER.

Spring-Bok (*Antidorcas* or *Gazella Euchore*), a species of antelopes, of a rich brown colour on the back and sides, and white on the belly. The horns are black, ringed, and lyre-shaped. A white stripe marks the back and rump, and the head has a prominent brown band on a white ground. The croup is provided with a covering of long hairs, which become very prominent in the course of the leaping movements of the S.-B., from which movements the popular name of the animal is derived. A full-grown S.-B. is a little larger than a roebuck. Immense hordes of spring-boks—numbering sometimes, it is said, 30,000—roam over the plains of S. Africa. The flesh is nutritious and palatable, and a strong, durable leather is manufactured from the hide.

Spring'er, a variety of dog allied to the spaniel. It has long ears, and is of a white colour with red spots. The nose and palate are black, and the head is small. The S. is chiefly valuable for raising game in close underwood.

Spring'field, the name of many towns in the United States. (1) The capital of Illinois, U.S., 180 miles S.W. of Chicago by rail. It has sixteen churches, seven newspapers, five ward-schools, and several higher educational institutions, including the State University. The State capitol, commenced in 1867, and estimated to cost $3,500,000, stands in the great central square. Abraham Lincoln was a lawyer in S. before his election to the Presidency, and a national monument has been erected to him in the Oak Ridge Cemetery at a cost of about $200,000. The manufactures of S. are inconsiderable, but it is the centre of a rich agricultural district. Pop. (1870) 17,364; estimated (1877) at 25,600.—**S.** (2) a city of Massachusetts, U.S., on the Connecticut River, 98 miles W. of Boston. It has a fine City Hall, twenty-seven churches, five newspapers, and twenty-nine schools. It is the seat of the United States armoury, established in 1794, and now employing about 350 men, though during the war 3000 men were employed, and 1000 rifles produced per day. The arsenal has accommodation for 300,000 stand of arms. There are also large private manufactories of arms, as well as of other hardware goods, and cotton and woollen fabrics, the falls of the Mill River providing good water-power. Five lines of railway centre in S., three meeting in one depôt. Pop. (1870) 26,703.—**S.** (3) a town of Ohio, U.S., on the Mad River, 80 miles N.E. of Cincinnati. It has twenty churches, seven newspapers, and seventy factories, employing about 4000 men. The principal branch of manufacture is agricultural machinery. S. is the seat of the Wittenberg Lutheran College, and several other educational institutions. Pop. (1870) 12,622.—**S.** (4) a city of Missouri, on the Union Pacific railway, 241 miles S.W. of St. Louis, is the business centre for the whole of S.W. Missouri and N. Arkansas. It has several mining industries, a college, conservatoire, schools, &c., and is said to be growing rapidly. Estimated pop. (1877) 9000.

Springs, which form the evident sources of most river systems, are a stage in the cycle of phenomena which restores to the ocean the water which has been drawn by evaporation from it. Any outflow of water from the earth is a spring, and its supply is regulated by the precipitation of moisture over the earth's surface. This moisture, precipitated as rain, snow, hail, mist, or dew, is partly re-evaporated but partly drained off directly to contiguous channels. A third part, however, descends into the earth's crust, saturating such rocks and soils as are porous and permeable to water, or collecting in fissures or cavities in or above impermeable rocks. If all strata were horizontal, then the possibility of water descending into the crust of the earth would depend upon the nature of the upmost layer, and in any case the descent would be checked if a hard solid formation like granite or a stratum of clayey consistency formed one of the series of underlying rocks, for through such water cannot penetrate except along joints or fissures. Strata, however, are usually more or less upturned, so that their edges crop up out of the soil. Consequently a layer of sandstone or limestone may become saturated, though it is intermediate to two impermeable strata. The water precipitated along the outcropping margin sinks into the permeable rock, and is retained there by the bounding impermeable surfaces until circumstances are favourable to its exit. For example, the water-filled stratum may crop out again along the face of a cliff, or may be thrown up to the surface by the occurrence of a fault, or the water may gradually collect in a cavity from which it ultimately issues along a fissure. S. frequently issue from caves, through the roofs and

walls of which water drips or oozes incessantly. Artesian Wells (q. v.) indicate another means by which water finds its exit from the earth, being forced up by hydrostatic pressure through a joint or opening in the overlying impervious layer.

The water as it percolates through the surface rocks must of necessity carry along with it various substances in solution. When such natural salts are present in considerable quantity, the S. become what are known as mineral S. acquiring the peculiar properties which give them their medicinal value. S. which issue from great depths are often charged with carbonic acid and sulphuretted hydrogen. For detailed description of such S. and where they occur, see MINERAL WATERS; and under GEYSERS the subject of hot S. is entered into more fully.

Spring'tails. See PODURA.

Sprit (Old Eng. *spreot*, *spryt*, 'sprout,' from *spreotan*, Ger. *spriessen*), a spar crossing a fore-and-aft sail diagonally from the mast to the upper aftmost corner.

Spruce, or **Abies**, is a genus of *Coniferæ*, best distinguished from its near allies, the pines, larches, and cedars, by the persistent leaves being single instead of in clusters or tufts. The most important S. is the Norway S. (*A. excelsa*), which furnishes excellent timber (commonly known as white deal), and produces the chief supply of Burgundy pitch. Its bark also is used for tanning. The Hemlock S. of Canada (*A. Canadensis*) is a very ornamental tree, and though the timber is inferior, is valuable on account of the tanning properties of the bark. The young shoots are used in making S. beer. The white S. and the black S. are two other American important members of this genus.

Spruce-Beer, a wholesome fermented liquor prepared by boiling lump sugar (for white beer) or treacle (for brown beer) in water along with essence of spruce, and fermenting the whole with yeast. The following is Dr. Wood's method of preparing it:—Take of essence of spruce ½ pint, pimento and ginger (bruised), 5 ounces each, hops 5 or 6 ounces, and water 3 gallons, boil ten minutes, then add of treacle 3 quarts and warm water 11 gallons, stirring the whole together; when the mixture has become lukewarm, add of yeast 1 pint, and allow fermentation to proceed for twenty-four hours before bottling the beer. *Medicinally*, S.-B. is diuretic and antiscorbutic.

Spru'ner, Karl von, a German historian and geographer, was born at Stuttgart, 1803, and educated at Munich for military service, early showing a taste for the studies to which he devoted his life. His chief works in cartography are a *Hist.-Geogr. Hand-Atlas*, with 122 maps (Gotha, 1837-52; 3d ed. 1865), *Hist. Atlas von Baiern* with 7 maps (*ib.* 1838), *Tabellen zur Geschichte der Deutschen Staaten* (*ib.* 1846-48), *Hist. Schul-Atlas von Deutschland* (2d ed. 1866), *Hist. Geogr. Schul-Atlas*, with 23 maps (*ib.* 8th ed. 1875), *Hist. Geogr. Hand-Atlas* (*ib.* 1856; new ed. 1877). His principal writings are *Leitfaden zur Geschichte von Baiern* (2d ed. Bamb. 1853), *Pfalzgraf Rupert der Cavalier* (Mun. 1854), and *Die Wandbilder des Baiern Nationalsmuseums*, accompanying Jos. Albert's photographs (Mun. 1868). Having risen through various grades, he was made adjutant-general by Ludwig II. in 1864. Apart from their minuteness and accuracy, S.'s works are valuable as illustrations of the interdependence of his two subjects. See Justus Perthes' *Verlags-Katalog* (Gotha, 1878).

Spuil'zie is the name given in Scotch law to the violent removal of the goods of another without legal warrant or authority. The person thus acting may be sued not only for the recovery of the goods, but for all the profits that might have accrued to him from their use.

Spur (Old Eng. *spura*, Ger. *sporn*, Gael. *spor*), a metal instrument composed of a *shank*, *neck*, and *prick* or *rowel*, fastened to the heel of a horseman to goad his horse to greater speed. Its use cannot with certainty be traced further back than Roman times. Early spurs had no neck, a prick being rivetted to the shank. Prick-spurs had straight necks in the 11th c. and bent ones in the 12th c. Rowels first appeared early in the 14th c. The neck was then short and inclined downwards, but in the succeeding c. it was made straight and very long, while the rowels bore from 12 to 18 points. The S. afterwards was shortened, and the fashion in rowels of different forms changed very much. The spurs of mediæval knights were gilt and those of esquires silvered. 'To win his spurs' meant to gain knighthood.

Spurge (Fr. *espurge*, Lat. *expurgare*, 'from the medicinal effects'), a vast genus (upwards of 700 species) of herbs, shrubs, or soft-wooded trees with fleshy branches, abounding in milky juice. An extensive group, abounding in S. Africa, have succulent, spiny, or unarmed, often melon-shaped or cactus-like stems. The flower-heads resemble single flowers, consisting of a calyx-like cap-shaped involucre, with 4-5 teeth, alternating with as many large horizontal glands, which enclose 10-15 male and 1 central female flower; the capsule separating when ripe into its three 2-valved constituent carpels. For ordinal characters see EUPHORBIACEÆ. The genus is represented in all climates excepting the Arctic. Eleven non-important species are natives of Britain, and three others are more or less naturalised. Of the latter the caper S. (*E. Lathyris*) has seeds containing a powerfully purgative oil. The most noteworthy medicinal species are *E. resinifera*, furnishing the intensely acrid gum-resin known in commerce as euphorbium, used principally as a vesicant in veterinary practice; *E. ipecacuanha* of N. America—called wild ipecac—the root-bark of which possesses emetic, expectorant, and cathartic properties; *E. corollata*, of which the root is officinal in the United States pharmacopœia as an emetic; and *E. nerii-folia* of India, yielding a juice employed externally in native medicine, while the root is used as a remedy in snake-bites. Various species with brilliant scarlet bracts are grown for ornament.

Spurge Laurel. See DAPHNE.

Spur'geon, Charles Haddon, the son of an Independent minister, was born at Kelvedon, Essex, June 19, 1834, and soon 'by his pious precocity attracted the attention of all around him.' After four years' schooling at Colchester, he became an usher at Newmarket (1849) and at Cambridge (1850), where, having joined the Baptists, he began to preach, a lad in his seventeenth year. Receiving an invitation to the Baptist chapel of New Park Street, Southwark (1853), 'he came, he preached, he conquered,' and in the following spring entered upon its pastorate. In two years' time his fame had outgrown his church, and he had to hold services in the Surrey Music Hall till the opening of the Metropolitan Tabernacle (1861) gave him a building holding 6000 persons. Here he has since continued to labour, with the exception of short excursions at home and on the Continent. Opinions differ as to his preaching powers, but measured by the standard of success they should be great, the Tabernacle membership having steadily increased from 1178 (1861) to 5152 (1877), whilst at the Crystal Palace and Agricultural Hall he has attracted congregations of 20,000 and 12,000 persons. Up to 1877 his Pastors' College (opened 1855; rebuilt 1874) had trained 388 pastors, and the Stockwell Orphanage (opened 1869) had received 428 orphans. His works, moreover, have had an enormous sale—the *Sermons* (1855 *et seq.*), the monthly *Sword and Trowel* (1865 *et seq.*), in which *John Ploughman's Talk* (260,000th, 1877) first appeared, the *Lectures to My Students*, &c. See Stevenson's *S., His Life and Work* (Lond. 1877).

Spurn Head, the extreme point of a peninsula in the S.E. of Yorkshire, at the mouth of the Humber, 15 miles S. of Withernsea. It is connected with the mainland by a causeway of pebbles and sand 2½ miles long, and on it are two lighthouses, one 90 feet high, built by Smeaton in 1776.

Spur'rey (*Spergula*—from Lat. *spergo*, alluding to the *scattering* tendency of the seeds), a genus of *Caryophyllaceæ* of two or three species of annual herbs with forked branches, occurring as weeds on cultivated ground in most temperate countries. *S. arvensis*, with awl-shaped leaves arranged (apparently) in whorls, and white flowers in stalked panicled cymes, is the one frequent in Britain. A tall variety of it with large seeds (*S. maxima* of Weihe) is recommended as a commencing crop for poor sandy soil intended to be used ultimately for sowing barley and rye. It serves both for green fodder and for mixing with grass hay. The seeds yield a bland oil.

Spurz'heim, Johann Kaspar, M.D., the phrenologist, was born at Longwich, near Treves, Rhenish Prussia, December 31, 1776. At Vienna, where he went to study medicine in 1799, he attended the lectures of Dr. Gall, whom he accompanied in 1805 on a lecturing tour through Germany, France, Prussia, and Denmark. In 1807 they settled at Paris, and worked together

at their common subject. In 1813 S. separated from Gall, and removed to England, where he made the system very popular. In 1832 he went to the United States, but had hardly begun his lecturing when he died at Boston, on November 10th of the same year. S. wrote numerous works bearing upon phrenology, both in English and French, and a few more general works, including *Elementary Principles of Education* (1821), and *Sketch of the Natural Laws of Man* (1828). The system he advocated is discussed under PHRENOLOGY.

Spy (French, *espion*), in war, a person employed to obtain by surreptitious means information regarding the enemy, and sent into the hostile camp or territory under a disguise and on false pretences. Spies may be broadly divided into two classes, viz., local spies, such as men accidentally employed, and the regular paid spies attached to the intelligence department of an army. The latter are most useful auxiliaries, as by a proper use of their services the most secret designs of the enemy may be discovered. They are liberally paid on account of the danger of their office, as all proved spies captured by an army are summarily put to death. Though this stern martial law prevails, no stigma attaches to the general who employs spies, these being considered essential to the pursuit of war.

Squad'ron (Lat. *quadra*, 'a square,' Ital. *squadra*, Fr. *escadron*), the unit in cavalry tactics, consists of two troops of horse, ranging in strength from 120 to 200. In the navy a S. is a section of a fleet, under the command of a flag-officer.

Squa'lus. See SHARK.

Squamipen'nes. See CHÆTODON.

Square, in geometry, is a quadrilateral whose sides are equal and whose angles are right angles. Its area is found by multiplying the number expressing the length of the side by itself, and hence a number so treated is said to be *squared*. Conversely, to extract the *S. root* of a given number is to find that number which when multiplied by itself will give the original number. See EVOLUTION AND INVOLUTION.

Square, in military evolutions, is the quadrilateral formation of troops for the resistance of cavalry attack. The Greek *syntagma* was a solid S. of sixteen men on each side. In modern warfare the S. is formed five deep; the outer rank kneels, the two next stoop, and in the centre are the officers on horse, the colours, &c. The S. could maintain a heavy rolling fire, but one of the results of the late Franco-German War has been its abandonment on account of the subordination of cavalry to field artillery of greatly increased precision and range.

Squash. See GOURD.

Squatt'ers, a name which is probably of American origin, as appears from Washington Irving's *History of New York*, but now applied almost exclusively to the holders on lease from the Government of large sheep and cattle 'runs' in Australia and New Zealand. The S. are in most colonies being driven further and further inland as their runs near the coast are being thrown open to 'free selection,' *i.e.*, permanent appropriation in small quantities under certain conditions of purchase.

Squid, a general name given to species of cuttlefishes or *Cephalopoda*, belonging to the family *Tenthidæ*.

Squier, Ephraim George, American geographer and archæologist, was born at Bethlehem, New York, 17th June 1821. He began life as a schoolmaster, and was subsequently editor of several country newspapers. His first work was an account of an examination of the aboriginal monuments in the valley of the Mississippi, which was published in 1848 as the first of the *Smithsonian Contributions to Knowledge*. In the next year he published his *Aboriginal Monuments of the State of New York*. Being appointed United States Chargé-d'Affaires to the Republics of Central America, he interested himself greatly in a proposed inter-oceanic railway, which was not, however, carried out, though it was surveyed, and a *Report* published in London (1859). In 1863 he was appointed United States Commissioner to Peru, where he remained two years, but, owing to a protracted illness on his return to New York, his book called *Peru: Incidents of Travel and Exploration in the Land of the Incas*, did not appear until 1876. His other principal works are *Notes on Central America* (1854); *Waikna, or Adventures on the Mosquito Shore* (1855); *The States of Central America* (1857); *Monograph of Authors who have written on the Aboriginal Languages of Central America* (1861); and *Honduras: Descriptive, Historical, and Statistical* (1870). In 1851 S. received the gold medal of the French Geographical Society.

Squill (*Scilla*) is a genus of *Liliaceæ* numbering about 72 known species of bulbous plants with radical linear leaves; usually blue flowers (rarely purple or white), in racemes on leafless scapes; perianth segments six, free or nearly so; capsule three-angled, loculicidally three-valved, seeds small, swollen. The genus is confined to the Old World. Three are British. *S. autumnalis*, in which the leaves are autumnal, succeeding the flowers, is confined to a few counties in S. England; whilst *S. verna*, with leaves appearing in spring in anticipation of the light-blue fragrant flowers, is met with in localities near the coast between Cornwall and Shetland. The third is the familiar wild hyacinth often called 'bluebell' in England, the 'English Iacint' of old writers, the *Hyacinthus non-scriptus* of Linnæus, now named *S. nutans*. It is common from Ross southwards, often occurring in such profusion as to render large tracts of woodland a sheet of blue from April to June.



Scilla Siberica.

The medicinal S. belongs to an allied genus of the tribe *Scilleæ*, named *Urginea*, comprising 24 species spread through the whole of Africa, and reaching Hindostan and S. Europe. It is the species known as *U. scilla* or *maritima* (formerly *S. maritima*), a native of the coast district from Syria to the Canaries, appearing also in the Cape flora. From a bulb of four to six inches in diameter leaves are produced in spring, followed in autumn by a raceme of whitish flowers borne by a round scape of one to three feet high. For the preparation of the drug the bulbs are dug up, divided into four parts, the centre portion and outer scales removed, and the remainder cut into slices and gently dried. In this state it reaches the druggist's shop. *Medicinally*, S. is used as a diuretic in certain forms of dropsy, and as an expectorant. In large doses it causes vomiting, and in extreme quantity acts as a narcotico-acrid poison.

Squill'a, a genus of *Crustaceans* of the order *Stomapoda*, in which from 6 to 8 pairs of legs are developed, while the gills are borne, not in a spinal cavity, as in the pure shrimps and lobsters, but beneath the chest or abdomen. The shell is thin, and often membranous. The genus S. includes the species familiarly named Locust Shrimps (*S. mantis*).

Squint, or **Strabis'mus**, is a well-known deformity, usually commencing in early childhood, between two and six years of age, and depending on a want of parallelism in the visual axes, when the patient endeavours to direct both eyes to an object at the same time. In looking at a near object, the eyes start from the position of acquired convergence, which become greater than is necessary, and they are both directed to a point nearer than the object, so that double vision is produced. 'In order to see clearly and avoid the double images, the child renders one eye more divergent, so that it may be directed to the object, and as the two axes have become combined in a relation of convergence instead of in their original relation of parallelism, it follows that, when one of them turns outward to fix the object, the other turns inward in a greater degree than before.' The result is that the S. becomes fixed, and the vision of the squinting eye undergoes steadily progressive deterioration.

When the sight of both eyes is good, and when the S. does not depend upon paralysis, it is always curable, but it may be necessary to operate twice or even thrice. The operation consists in separating the tendon of the internal rectus muscle from the sclerotic, so that the muscle may form a new attachment posterior to its original one, and may produce by the same effort

of contraction a smaller degree of convergence than previously. The causes of S. are various. Intestinal irritation, such as from worms; cerebral irritation, as from teething, and hydrocephalus, frequently produce S. among children, but in the great majority of instances of confirmed S. the optic nerves themselves are ill-developed, being usually smaller than natural, of a more or less oval form, and of a dusky colour. See Holmes's *System of Surgery*.

Squints, an oblique opening through the wall of a church, so placed as to allow a view of the high altar from the transept or aisles. The term 'Hagioscope' is sometimes used.

Squire, a corruption of the word *Esquire* (q. v.), is applied in England to a country gentleman, being nearly equivalent to the Scotch 'laird;' while in the United States it denotes persons of very different ranks, and is often used as a mere slang nickname.

Squirr'el (*Sciurus*; Gr. *skia*, 'a shade,' and *oura*, 'a tail,' because the animal has part of its body covered by its upturned tail), a genus of *Rodent* quadrupeds belonging to the *Sciuridæ* family, in which the incisors are prominent and orange-coloured. The molars—ten in the upper jaw and eight below—are complicated in structure. The fore feet have rudimentary thumbs. No cheek-pouches are developed in the true S., of which the *S. Europæus* is the most familiar species. It is distinguished by a small head, prominent jaws and ears, and by a large bushy tail. A sitting posture is the normal attitude of the S., which grasps its food, consisting chiefly of nuts, with the fore paws. The fur becomes somewhat greyish during winter. The S. makes a nest of wood, leaves, moss, and other materials, and securely fixes it to the foot of a bough. The young number three or four, are born in June, and remain in the parent nest till the succeeding spring. To the genus *Sciurus* belong many of the N. American species, where the most typical squirrels are found. The black S. (*S. niger*) is a typical New World species, as also is the red S. (*S. Hudsonius*). The grey S. (*S. cinereus*) and long-eared S. (*S. macrotis*) are also famous N. American species, whose fur is in request as an article of commercial value. In the Southern States of America the *S. vulpinus*, or fox-S., which derives its popular name from its vulpine appearance, attains a length of 14 inches. Squirrels often prove singularly destructive in America; thus the *S. migratorius* has frequently caused immense damage to crops in Pennsylvania. In 1749 no less than 640,000 of these animals were killed, and a royalty of 3d. per head was paid for their destruction. The genus *Tamias* includes the ground or earth S., in which *cheek-pouches*, serving for the temporary stowage of food, are developed. *T. Lysteri*, the hackee or chipping S., is a familiar species. It attains a length of 11 inches, and has a brownish-grey fur. The flying S. (q. v.) belongs to the genus *Pteromys*.

Squirr'el-Monk'ey (*Callithrix*), a genus of *Platyrhine* or Old World monkeys, found in Brazil, and closely resembling squirrels in appearance. *C. cinereus* is a familiar species, also named the Saimiri another example is the *C. torquatus*, or Collared Callithrix. These monkeys are inoffensive and intelligent, and may become very tame.

Squitch. See COUCH GRASS.

Sráddha or **Shradh**. The funeral ceremonies in the Hindu ritual, which are of great importance both religious and legal, as it is through their performance that the soul of the departed obtains rest and the succession of property is transmitted to the heir. The S. proper, which is in fact a worship of departed ancestors, commences on the 11th day after death, the interval having been occupied with minor ceremonies personal to the deceased. Its essential feature consists in offering *pindas* or balls of rice to the spirits of all those who are recognised as agnates. It is accompanied by much feasting and costly gifts to the Brahmans invited to assist at the celebration, and is sometimes repeated at stated periods. Wealthy families pride themselves on spending many thousand pounds on this account.

Sru'ti or **Shru'ti** ('that which is directly heard or revealed'), the Sanskrit term for Revelation, applied to the three portions of the Veda (q. v.) which are believed to have no human author. It is opposed to Smriti (q. v.).

Sta'bat Ma'ter, a Latin hymn, in Leonine verse, on the sorrows of the Blessed Virgin, composed by the Italian Franciscan, Giacomo Bendetti, or 'Jacopone' as he was nicknamed, who died 25th Dec. 1306. It has been set to music by Palestrina, Pergolesi, and Rossini. The most popular setting and that most frequently performed is that of Rossini, which is distinguished by great brilliancy and richness of melody. The hymn has been translated into English by Bishop Mant (*By the Cross sad vigil keeping*, &c.) and the Rev. E. Caswell (*At the Cross her station keeping*, &c.), and is sung in the Catholic Church on the Feast of the Seven Dolours, in Holy Week, and during the Devotions for the Way of the Cross. See Lisco, *S. M.; Hymnus auf die Schmerzen der Maria* (Berl. 1843); and A. Schwartz, *How the S. M. was written* (Macmillan's Magazine, Aug. 1873).

Stabil'ity. See EQUILIBRIUM.

Stabular'ii. See NAUTÆ, CAUPONES, STABULARII.

Stacca'to (Ital.), a term denoting that certain musical notes are to be produced in a clear crisp manner. Dots are placed above the notes, or dashes when the S. is intended to be more marked. They have the effect of shortening the notes, and of supplying rests for the remainder of their natural length.

Stach'ys (Gr. 'a spike,' in allusion to the inflorescence), a genus of herbs or, rarely, shrubs of the natural order *Labiatæ*, with crenate or serrate leaves; whorled flowers; sub-campanulate; five-toothed calyx; four stamens; connivent, glabrous anthers; obtuse nutlets. There are about 160 known species, dispersed chiefly through warm, N., temperate, and Oriental regions. Of the five British species, *S. betonica*, or Betony, a frequent plant of thickets and overgrown hedgebanks, was formerly much used in medicine: the roots are nauseous and very bitter. Several species, which are ornamental from being clothed with shaggy white silky hairs, are grown in gardens, such as *S. germanica* (a very rare English species), *S. lanata* of S. Europe, and others. *S. coccinea*, from Peru and Chili, with large dark-scarlet flowers, is much cultivated as a greenhouse plant.

Sta'de (Low Ger. the 'place' or 'station;' comp. Old Eng. *Stede*), a town of Prussia, province of Hanover, on the Schwinge, 2½ miles from its confluence with the Elbe, and 22 W. by N. of Hamburg. It has considerable trade, manufactures tobacco, woollens, cottons, lace, and pianofortes, and carries on brewing, shipbuilding, and fishing. It has a winter harbour for Elbe vessels. The oppressive *Stader Elbzoll* ('S. Dues'), for centuries levied at Brunshausen on all goods passing up the Elbe, was in 1861 commuted for the sum of £465,000, paid by all the maritime states concerned, Great Britain contributing one-third. Pop. (1875) 8761.

Stad'holder (Dut. *stadhouder*), the name given in the United Provinces of Holland to the governor of a province, who was commander-in-chief of its military forces, and, except in the case of Flanders, supreme judge of its civil and military tribunals. At the beginning of the great struggle of the Dutch with Philip II. of Spain, William of Orange reassumed (1572) the title of S. of Holland and Zealand (to which he had been appointed in 1559), meaning thereby that the revolt of the Dutch was to combat the authority of Alva, not that of the King. This stadholdership, equivalent to the chief military and civil command of the Netherlands, passed in 1587 to Moritz, son of William, and S. was the hereditary title of the head of the state till the annexation of Holland to the French empire in 1802.

Sta'dium, in the Grecian games, the 'course' devoted to foot, as the Hippodrome (q. v.) to horse and chariot races, the two being similar in construction. The most famous S., that of Olympia, was 600 Greek feet in length, and was taken as the standard of the S. or measure of length, equalling 625 Roman and 606¾ English feet.

• **Staël-Holstein, Anne-Louise-Germaine, Baronne de**, was born at Paris, 22d April 1766. The only daughter of Necker (q. v.), Louis XVI.'s Minister of Finance, she grew up under the combined influence of a Calvinist mother and her father's philosophic friends. Montesquieu was her favourite author, and in her sixteenth year she annotated his *Esprit des Lois*; till, over-study injuring her health, she was sent to the country, and there read Richardson's and Rousseau's works. In 1786 the Baron de Staël-Holstein, Swedish Ambassador at

Paris, her co-religionist but senior, became her husband, and in the same year she published anonymously a three-act play, *Sophie ou les Sentiments Secrets.* Her first acknowledged work, *Lettres sur les Écrits et le Caractère de Rousseau* (1788), is full of that worship of Jean Jacques which, only tempered by admiration of the English constitution, led her to welcome the Revolution. But her sympathies stopped at the point where reform gave place to licence; and having vainly suggested a plan for the royal family to escape, she had herself to fly to England (1792), where she composed *Réflexions sur le Procès de la Reine, par une Femme* (1793), and the powerful *Reflexions sur la Paix, addressées à M. Pitt et aux Français* (1795). Sweden's acknowledgment of the French Republic allowed the Baron and his wife to return to Paris, but in 1796 she separated from her husband, only to join him shortly before his death (1802). Meantime she published *De la Littérature considérée dans ses Rapports avec l'État Moral et Politique des Nations* (1796), and as leader of the 'Cercle Constitutionnel' brought about Talleyrand's recall, formed Constant's views, and scenting the designs of Bonaparte, opposed the policy of the 18th Brumaire. 'I leave the whole world open to Mdme. de Staël, Paris only I keep to myself,' said Bonaparte, making good his word by banishing her and her friends, the Comte de Montmorency, August von Schlegel (q. v.), and Mdme. Récamier. Yet were these years of enforced wandering the period of her finest work, the novels *Delphine* (1802) and *Corinne ou l'Italie* (1807), and *De l'Allemagne* (1810), which, shedding on France the brilliance of Weimar's luminaries, originated French Romanticism (q. v.). In 1812 she privately married an officer of hussars, M. de Rocca, and the same year had to fly to Vienna, Moscow, St. Petersburg, and Stockholm. At length the fall of the Empire let her return to her loved capital, and having spent the last two years of her troubled life in the society of her old Doctrinaire and Constitutional friends, Constant, Guizot, Broglie, &c., she died at Paris, 14th July 1817. Her *Œuvres Complètes* (17 vols. 1820–21; new ed. 1830), and *Œuvres Inédites* (3 vols. 1836), contain, besides the already mentioned works, *De l'Influence des Passions sur le Bonheur des Individus et des Nations* (1796), *Réflexions sur le Suicide* (1812), and the posthumous *Dix Années d'Exil* and *Considérations sur les Principaux Événements de la Révolution Française.* See Maria Norris, *Life and Times of Mdme. de Staël* (Lond. 1853), and Mdlle. de Launay, *Mémoires de Mdme. de Staal* (Eng. trans. S. Bathurst, Lond. 1877).

Staff, in music, five parallel lines upon which and within the spaces they enclose the notes of a composition are printed. Guido d'Arezzo was the inventor of the first musical S., about A.D. 1022.

Staff, in the army, a body of officers not attached to particular regiments who are responsible for the general organisation and the harmonious co-operation of the various branches of the army. S.-officers act as assistants to the general in command in all questions relating to the procuring of military information, strategy, tactics, &c., and their duties require more than ordinary skill and ability. In time of war these include the drawing up of orders regarding the cantonment of troops, outposts, marches, and battles; the communication of the wishes of the commander-in-chief to the army, and the practical development of his plans; the collection and preparing of all necessary documents and maps, the sifting of information brought in by reconnoitering parties, spies, &c.; and the supervision of the condition and comfort of the troops. The S. superintends reconnaissances and guides the columns to their destined positions on a new movement being made.

The S. of the British Army includes (*a*) the general officers commanding divisions, district brigades, &c.; (*b*) the general S., which includes the officers of the Quartermaster-General's and the Adjutant-General's departments; (*c*) the personal S., consisting of officers attached to commanding general officers as military secretaries and aides-de-camp; and (*d*) the officers employed in connection with the civil departments at the War Office, and those engaged in recruiting and garrison work. Officers of the general S., unless of proved ability in the field, must pass through the S. College (q. v.). Those of the personal S. are appointed, after passing a qualifying examination, on the recommendation of the general to whom they are to be attached, and they hold their appointments during his pleasure. The Chief of the S. in time of war is an officer ranking next to the general in command of the army, and an immense amount of detail work falls to his share. A regimental S.—the adjutant, quartermaster, paymaster, &c.—is attached to each regiment.

The first permanent military staff (*etat majeur*) was made in France in 1783, and a similar establishment in England about 1800. The Great General Staff in Germany collects information relating to military affairs about every part of the world, different countries being assigned to different sections. The Intelligence Department of the War Office in England is a similar but much smaller organisation.

Staff'a (from the Teut. root *stauf* or *staef* (Eng. *staff*), a 'pole' or 'stake,' used in Germany of a perpendicular rock: S. is thus 'the isle of the pillared rocks'), a celebrated basaltic island off the W. coast of Scotland, lies 5½ miles N. of Iona, and nearly 7 miles W. of the nearest point of Mull. It is reached by steamer from Oban. The island is 1½ miles in circumference, about 144 feet above the sea at its highest point, and is uninhabited. It is visited solely on account of its caves, the largest of which, Fingal's Cave, is 240 feet long and 66 feet high. Its roof is partly formed of pillared basalt and partly of amorphous trap, the sides are straight vertical prisms of basalt, washed at their base by a deep and often tumultuous sea. From the roof many stalactites depend.

Staff Coll'ege, a military institution near Sandhurst, founded in 1858, for the instruction of officers desirous of being placed on the staff of the army. It is open to officers of all branches of the service who have served five years, but the number is limited to forty students, selected by competitive examinations held annually in London about the month of June; and only one officer at a time from one battalion of infantry or regiment of cavalry, and only ten officers from the two royal corps of artillery and engineers, can belong to the college. The course lasts two years (four terms), and the expenses, with the exception of mess subscriptions, are borne by the State. A candidate for admission must produce a certificate from his commanding officer that he is a good regimental officer, and a report from the three senior officers of his regiment, a medical certificate of health, and a certificate that he has passed his troop or company examination.

Staff Corps, a corps which served on staff duties in the Peninsular campaigns of Wellington. There is no corps of this name now in the home army. In India the S. C., raised after the Mutiny of 1857–58, is divided into three branches, one of which is attached to each Presidency.

Staff'ord, the county town of Staffordshire, on the left bank of the Sow, 26 miles N.W. of Birmingham. Its two parish churches—St. Mary's, a fine cruciform building in Early English style, and St. Chad, a smaller edifice of the Norman period—have been recently restored, the former in 1847, the latter in 1875. A new church, St. Thomas, was erected and endowed in 1866 at the cost of Mr. J. Tyler, and a Roman Catholic chapel was also erected in 1862. In 1875 the foundation-stones of a new borough hall and law court were laid, and in 1874 a public library, called after its founder the William Salt Library, was opened. It has also a county jail and two county lunatic asylums. A bust of Izaak Walton was placed in 1878 in St. Mary's, where he had been baptized in 1593. S. possesses a grammar-school founded by Edward VI. in 1556. It is a great railway centre. The chief industries are tanning, engineering, and the manufacture of shoes. S. has one weekly newspaper, and returns two members to Parliament. Pop. (1871) 15,946.

Staff'ordshire, one of the midland counties of England, is bounded on the N.W. and N. by Chester, on the E. by Derby and Leicester, on the S. by Warwick and Worcester, and on the W. by Salop. Area, 732,434 statute acres; pop. (1871) 858,326. Geologically, the central portion of the county consists of red marl (in which occur valuable brine springs), the Bunter conglomerate, and Keuper and other sandstones. In the S. of the county is the great South S. coalfield, in which is included the famous ten-yard coal. The smaller coalfield in the N. of the county is celebrated for its bands of ironstone and fireclays. In both cases this mineral wealth has led to the establishment of many works for the production of crude and finished iron, and in the northern extremity to the establishment of the earthenware

trade in the district known as the S. Potteries. The mountain limestone in the N. and the Silurian limestone in the S. of the county are employed to a large extent as fluxes in the manufacture of pig-iron. The millstone grit which overlies the mountain limestone in North S. is quarried for building purposes as well as for millstones. Lying between the coalfields of North and South S. is the Cannock Chase coalfield, the opening up of which is an event of recent date. Lead and copper mining are almost extinct industries in S. The county slopes gradually from the N.W., the principal river being the Trent, which rises on the northern border, and flows S.E. to Burton, 2 or 3 miles below which it enters Derbyshire, having received numerous affluents. A perfect network of railways and canals covers the county, the most important of which respectively are the London and North-Western Railway, the North S. Railway, the Midland Railway, and the Trent and Mersey Canal. In 1875, in the North S. district, 12,595 persons were employed in the coal mines; in the same year, 1,654,474 tons of iron were produced over the whole county. In 1877 the 23 furnaces in blast of North S. produced 255,383 tons of pig-iron; the 57 of South S., 428,276 tons. For parliamentary purposes S. is divided into three districts —N., W., and E. Staffordshire—each of which returns two members. The chief towns are Stafford (q. v.), Lichfield (q. v.), Wolverhampton (q. v.), Walsall (q. v.), Burton (q. v.), and Hanley (q. v.), the capital of the 'Potteries,' a hilly and picturesque corner in the N.W. of the county, 10 or 12 miles long. Three Roman roads traverse the county, which was the scene of not a few struggles between the English and Danes, between the Red and White Roses, and again between Cavaliers and Roundheads, but it contains no antiquarian remains of any great interest.

Stag or **Red Deer** (*Cervus elephas*), a typical species of *Cervidæ* or Deer (q. v.), occurring in the N. of Europe and Asia. It was once found throughout the whole of Britain, but is now confined to the Scottish Highlands. The horns or antlers are round, and have a basal *snag* in front. The females are hornless, and are named *hinds*. The horns of the first year are mere bony projections; they advance in development during the second year, when the stag is named a *brocket*. In each succeeding year the horns grow more and more branched, the stag being named a *hart* in its sixth year, when the horns may be said to reach their maximum size. As in all deer, the horns are shed annually. The average height of a full-grown stag is about 4 feet at the shoulder; the winter coat is greyish-brown; in summer, brown is the prevailing tint. The food of the S. consists of grasses and the young shoots of trees, lichens forming the greater part of its food in winter. The S. is a powerful runner and swimmer. Driven to bay, it becomes a formidable adversary to the largest and most powerful staghound, or even to man himself. The pairing season occurs in August, and the males then engage in combats for the females, and become peculiarly fierce. The flesh is somewhat coarse.

Stag'-Beetle (*Lucanus cervus*), a species of beetle belonging to the *Lamellicorn* (q. v.) group, and so named from the *mandibles* or jaws of the male, which project on either side like the horns of the stag. The common S.-B. attains a length of about 2 inches. It is found in summer in the neighbourhood of oak woods, its larvæ being very destructive to the foliage of the oak and willow. The S.-B. was probably the *Cossus* of the Romans, who regarded it as a delicacy; the modern genus *Cossus* including the *Oak-moth* (*C. ligniperda*). *L. dama* is another species. The larva of *L. cervus* is said by Rosel to exist in that stage of existence for six years.

Stage. See Theatre.

Stage-Coach', a vehicle for carrying passengers on regular routes, the journey being accomplished by *stages*. Such vehicles were formerly universal in Great Britain, but the railway system has led to their almost entire discontinuance, except in localities to which the railway has not reached. The first 'stages,' so called, were waggons which carried goods and passengers towards the close of the 16th c. In 1610, Anderson, a native of Stralsund in Pomerania, secured the royal privilege of running stage-coaches and waggons between Edinburgh and Leith. About 1640, stage-coaches plied between the metropolis and the principal towns in the kingdom. The speed was slow on account of bad roads and the cumbrous nature of the vehicles. Eight days in summer and ten in winter were occupied in traversing the road between London and Exeter, and even so late as 1754 it was considered quick travelling to reach Manchester from London (187 miles) in four and a half days, and Edinburgh in ten days in summer and twelve in winter. The Edinburgh and London S.-C. of 1754 was the first to be mounted on steel-springs. Seats were added on the roof for outside passengers about 1779. After 1784, stage-coaches of improved construction were gradually introduced, and roadways were kept in better repair, so that a speed of 8 miles an hour was not uncommon. In France and Spain the S.-C. is known as the Diligence (q. v.); and in Germany as the *Postwagen* or *Postkutsche*. The Russian *tarantass* serves the purpose of a S.-C., but is a very different kind of vehicle.

Stagg'ers, a disease of horses, often ending in convulsions and stupor or coma. 'Mad S.' is essentially a brain-disease, and is almost invariably fatal. A commoner form is known as 'Stomach S.' or 'Grass S.' It is caused by acute indigestion, the result of the stomach having been overloaded with wet grass and like food. S. occur most frequently in autumn, and is marked by distention of the abdomen and by the characteristic gait. The staggering is often relieved by taking blood from the palate; but the constitutional treatment consists of purgation, injections, and warm applications to the belly.

S. in sheep is caused by the presence in the brain of the *Cœnurus cerebralis*, the *scolex* or immature form of a tape-worm (*Tænia serrata*), which in its mature state inhabits the digestive system of the dog.

Stag'hound. See Deerhound.

Stahl, Friedrich Julius, an eminent German jurist, was born of Jewish parents at Münich, January 16, 1802, at the age of seventeen passed over to Christianity, became professor at Würzburg (1832), Erlangen (1835), Berlin (1840), and sought to combat 'radical' liberalism, basing both jurisprudence and civil polity on Scripture. A member of the First Prussian Chamber from 1849, he was one of the ablest leaders of the reactionary party in Prussia, and opposed with eloquence and vigour the broadening of the Prussian constitution. He died at Bruckenau, August 10, 1861. S.'s great work is *Philosophie des Rechts nach Geshichtl. Ansicht* (4th ed. 1870), but he was an incessant and brilliant polemic, and wrote numerous pamphlets and treatises.—**Georg Ernst S.**, an eminent chemist and physician of the 17th c., was born at Anspach, 21st October 1660. He was educated at Jena, and filled in succession the offices of court physician to the Duke of Weimar, professor of medicine at the University of Halle, and physician in ordinary to the King of Prussia. He died at Berlin, 4th May 1734. S. was the first expounder of the doctrine of *phlogiston*, a theory of combustion, which, though erroneous, yet helped at the time to give coherence to chemistry. He also held the theory of a *vital force* or *anima* residing in the body, whose motions it directed. His writings were very numerous—250 in all, but his most important is *Theorea Medica Vera* (Halle 1737). See Lemoine's *Le Vitalisme et l'Animisme de Stahl* (Paris 1864).

Stained Glass is glass permanently coloured by fluxing mineral pigments on its surface by means of heat. See Glass Painting.

Staines, an interesting old English town, in Middlesex, on the left bank of the Thames, 6 miles S.E. of Windsor, and 18 S.W. of London by the South-Western Railway. Its church of St. Mary, rebuilt in 1828, has a tower by Inigo Jones (1631), and the granite bridge of three arches, which here crosses the river, was designed by Rennie (1832), and cost £40,000. A stone (hence the town's name) bearing date 1285 here marks the limit of the Thames Conservancy. A Roman Catholic church, in Gothic style, was erected in 1868. There are mustard mills, breweries, and market-gardens. S. has a well-known race-course. Pop. (1871) 3659.

Stains for Wood are preparations for colouring wood in imitation of mahogany, rosewood, walnut, ebony, and other costly woods. The stains are for the most part composed of decoctions of dye-woods, modified with pigments, metallic salts, acid, &c., or of alcoholic solutions of turmeric and certain resins, as gamboge and dragons' blood.

Stair, Earls of. See DALRYMPLE.

Stalac'tites and **Stalag'mites** are deposited by evaporation from waters charged with carbonate of lime. The mineral water, dropping from the roof of a cave, leaves behind it a small residue of what it held in solution, and by constant accretions this residue grows downwards like an icicle from the roof. Simultaneously, a similar but upward growth takes place at the spot vertically below where the successive drops of water fall and evaporate. The former is called a stalactite, the latter a stalagmite; and not unfrequently the two portions meet and form a continuous pillar.

Sta'leybridge, a municipal and parliamentary borough, 7½ miles N.E. of Manchester, partly in Lancashire and partly in Cheshire, in the parishes of Ashton-under-Line and Dukinfield, with which towns it is practically united. It has communication by railway in all directions, has two weekly newspapers, and returns one member to the House of Commons. Its chief manufacture is that of cotton goods, but it has also numerous iron foundries and machine-works. Pop. (1871) 21,092.

Stall'baum, Johann Gottfried, born at Zaasch in Prussian Saxony, 25th September 1793, in 1808 entered the Thomasschule, and in 1815 the University of Leipzig, whither after two years of teaching at Halle (1818–20) he returned to be an under-master in his old school. He became its rector (1835), and in 1840 was appointed extraordinary professor, retaining both offices down to his death, 24th January 1861. S. did good service to classical philology by his critical edition of Plato's Works (12 vols. Leip. 1821–25), a separate edition of his text (8 vols. Leip. 1825), and an edition with a commentary in the *Bibliotheca Græca* (9 vols. Gotha, 1827; new ed. 1867). Besides other editions of the classics, he published *Ueber den innern Zusammenhang musikalischer Bildungder Jugend mit dem Gesammtzwecke des Gymnasiums* (Leips. 1842), *Das Griechische und Lateinische in unseren Gymnasien* (Leip. 1846), &c.

Stambul', or **Istambul'** (Gr. *Es tan polin,* 'to the city'), the Turkish name of Constantinople (q. v.).

Stalls, in churches, are fixed seats ranged along the choir, with a screen behind, projecting elbows, and frequently canopies overhead.

Sta'mens are the male or fertilising organs of a flowering plant. Collectively they constitute the *andrœcium* ('male habitation'). In a perfect and complete bi-sexual or hermaphrodite (q. v.) flower they number from one to many, and are situated within the petals and outside the pistil. S. usually consist of a stalk, called a *filament,* bearing at the top an *anther* divided into two pouches or *cells.* When these two cells are not closely contiguous, the portion of the anther that unites them is called the *connective.* The anther-cells are filled with *pollen,* consisting of minute grains commonly forming a yellow dust, which, when the flower expands, is scattered from an opening in each cell, and is conveyed either by the wind, by the agency of insects, or by peculiar movements or positions of the S. or the carpels to the female organ or Pistil (q. v.), there to effect fertilisation, and enable the Ovules (q. v.) to develop into ripe Seed (q. v.). The filament is often wanting, and the anther *sessile,* yet still the stamen is perfect; but if the anther is wanting, or does not contain pollen, the stamen is imperfect, and is then said to be *barren* or *sterile, abortive* or *rudimentary.* Imperfect stamens are often called *staminodia.* S. are *monodelphous* when united by their filaments into one cluster, *diadelphous* when united into two clusters (the term is more especially applied to certain *Leguminosæ*), *triadelphous, pentadelphous, polyadelphous* when so united into three, five, or many clusters; *syngenesious* when united by their anthers in a ring round the pistil; *didynamous* when there are four S. in two pairs, those of one pair longer than those of the other (as *Labiatæ*), *tetradynamous* when (as in *Cruciferæ*) there are six, four of them longer than the two others. As regards the mode of attachment, S. are *hypogynous* when growing directly from the receptacle beneath the ovary (as in the buttercup); *periginous* when springing from the calyx (as in the wild rose); *epipetalous* when springing from the corolla (as in the primrose); *epigynous* when attached to the upper part of the pistil (as in the carrot). An anther is *adnate* when continuous with the filament, the anther-cells appearing to lie their whole length along the upper part of the filament; *innate* when firmly attached by their base to the filament; *versatile* when attached by their back to the very point of the filament, so as to swing loosely. Anthers have often, on the connective or their cells, appendages termed *bristles, spurs, crests, points, glands, &c.,* according to their appearance. To let out the pollen, anthers open or *dehisce,* like capsules, in *valves, pores,* or *slits.* Dehiscence is *introrse* when the opening faces the pistil, *extrorse* when towards the circumference of the flower. The pollen consists of granular cells variously shaped, marked, or combined, peculiar forms being constant in the same species, or often in large genera, or even natural orders. In the Linnæan system the twenty-three classes of flowering plants are founded on the number, position, relative lengths, and connection of the S.

Stam'ford, a market-town and parliamentary borough in the county of Lincoln, on both sides of the river Welland, here dividing Lincoln from Northampton, 12 miles N.W. of Peterborough. It has several schools, two of which are handsome buildings, recently erected under a new scheme by which an endowment of £600 a-year has been supplemented by an annual grant of £1500 from the surplus funds of Browne's Hospital, founded in the reign of Richard III. for ten men and two women. The new scheme provides for a high-class school, a middle-class school for boys and girls, and an elementary school. Of the churches, All Saints' and St. Mary's, both fine specimens in the Early English style, are the most interesting. S. has an infirmary erected by public subscription, and supported chiefly by a bequest from Henry Frier, at one time surgeon in the city, and recently enlarged at a cost of £7000; a museum, library, and several almshouses, the principal of which is Browne's bede-house, recently rebuilt. The district is almost exclusively agricultural. S. has two weekly newspapers, one of which, the *Mercury,* has been established since 1695. Since 1867 S. has returned only one member to parliament. Pop. (1871) 8086. During the Middle Ages S. was frequently visited by the English sovereigns, and in 1566 Queen Elizabeth was entertained here by Cecil, whose lands have now become the property of the Marquis of Exeter, and who benefited the town greatly by inducing certain Flemish refugees, silk and serge weavers, to settle in it in 1572.

Stam'ford, a favourite summer resort of the inhabitants of New York, at the entrance of Mill river, in Long Island Sound, in Fairfield County, Connecticut, 32 miles N.E. of New York city. Pop. (1870) 9714.

Stamm'ering, a condition of speech in which the subject suffers from a want of power to combine the varied muscular acts involved in the production of articulate sounds. The causes of S. are probably multifarious and diverse, and depend on very varied states of the nerve-centres. Dr. Marshall Hall maintained that in S. the nerve-centres or parts regulating S. were invariably affected. The cause of S. is named *centric* when the nerve-centre itself is affected, and *excentric* when it arises from impressions made upon its afferent nerves—*i.e.,* nerves proceeding to the centres. There is every probability that the great majority of cases of S. depend on causes connected with derangement of nerve-centres. The fact that S. is often congenital seems to prove this. The stammerer meets his greatest difficulty in pronouncing consonants such as *f* and *v,* which entirely supersede the passage of air through the nose, and where necessity arises for firm contraction of the parts of the mouth. The *cure* of S. has formed the subject of much discussion, and is even yet made subject-matter for empirical treatises and quack treatment. Attention to the patient's general health, and the careful examination of his habits and nervous constitution by a recognised medical authority, are necessary preliminaries to the cure or alleviation of this complaint. Thereafter, a strict attention to the mode of speech of the patient, and the acquirement of the habit of slow and distinct pronunciation, are amongst the means most likely to be successful in inducing a cure. Dr. Neil Arnott of London used to assert that S. might frequently be cured if the patient learned to connect his words by a kind of intonation or sustained note, so as to preclude the spasmodic stoppage of breath so familiar in this complaint.

* **Stamp Duties** are taxes for an amount expressed upon the paper or parchment on which most legal documents require to be written. When a stamp is necessary to the legal validity of a

document, its omission or insufficiency in value may, in certain cases, be remedied by subsequent payment to the Inland Revenue of the duty and penalty. The S. D., first imposed in the reign of William III., were consolidated and amended in 1870.

Stamp'ing of Met'als. Many articles are shaped from sheet metal by means of steel dies brought together in a stamping-press. The stamping-machines assume various forms, and are worked manually, by steam, or by hydraulic power. The ordinary stamp used for brassfoundry consists of an iron hammer or 'ram' working between two upright pillars or guides. An intaglio die is fixed to the bed of the machine, and a raised counterpart or reverse die to the hammer. A 'blank' or piece of sheet metal is laid on the lower die, and the hammer, elevated by a rope or other means, is allowed to descend, with the result of sinking the sheet metal into the die beneath. Several successive blows are given, and between them the metal is annealed in order to restore its ductility. Balance weights of chandeliers and other globular articles are stamped in pieces which are afterwards soldered together. Vessels of tinned iron are produced by pressing the sheet-metal into as many as sixteen to twenty-five moulds in succession, each mould approaching more and more to the form of the finished article. Annealing is performed after each pressing, and the vessel is finished by tinning and burnishing. Objects in German silver are stamped in like manner.

Stan'chion (Old Fr. *estançon*, 'a prop or support'), an upright iron bar of a window or open screen; in shipbuilding, a post for supporting deck-beams, an awning, or quarter-railing, &c.

Stan'dard, a kind of Flag (q. v.), larger than the Banner (q. v.), which came into use in England in the time of Edward III. Used solely for display, it bore all the achievements of its owner, and varied in size according to his rank. The name S., in the military service of the United Kingdom, is now applied only to the flags of cavalry regiments not composed of dragoons or dragoon-guards. Each regiment has two of these, both silken—the first, or royal S., crimson, with a device; the second, or regimental S., of the same colour as the facing of the regiment, and bearing a different device. The present Royal S. is of a square or oblong form, and bears the royal arms only.

Stan'dard, in carpentry, a post or upright piece in a truss; in shipbuilding, a knee-timber with one arm fastened to the upper side of the deck and the other arm to the ship's side.

Stan'dard, Battle of. See NORTHALLERTON.

Stand'ing Or'ders, the name given to regulations made by legislative or municipal assemblies for the regulation of their proceedings, and which are of continual obligation unless rescinded or repealed. See PARLIAMENT.

Stan'dish, Miles, one of the 'Puritan fathers,' and best known as the hero of Longfellow's poem, *The Courtship of Miles S.*, seems to have been born in Lancashire about 1584, and claimed to be a cadet of the knightly family of S. of Duxbury Hall in that county. After serving for some time in the Netherlands, where he attained the rank of captain, S. went out in the *Mayflower* in 1620, rendered good service to the young colony in its dealings both with Indians and with the mother country. He founded the township of Duxbury in Plymouth Co., Mass., where he died, 3d October 1655, and where a monument to him was commenced in 1872. His friendship with John Alden is well known to all readers of Longfellow. Other interesting information about S. is given in Justin Winsor's *History of Duxbury* (1849).

Stan'hope, Lady Hester Lucy, daughter of Charles, third earl Stanhope, and Hester, daughter of Pitt, first earl of Chatham, was born in London, 12th March 1776. When her father got into difficulties through his romantic advocacy of republicanism, Lady Hester went to live with her uncle the prime minister, and for upwards of ten years she was one of the most eminent personages in political society; but on Pitt's death in 1806 she retired to Wales, and in 1810, under the influence of a strange belief in her own destiny, determined to settle in Syria. She finally took up her residence in 1813 in the old convent of Mar Elias in the Lebanon, and there she lived for more than a quarter of a century in almost complete alienation from European civilisation. She died there, 23d June 1839. The mingled pomp and poverty of her establishment; the power she exercised and the insults to which she was subjected; her own strange mixture of masculine capacity and childish caprice; her domestic despotism, and princely liberality, and all the endless peculiarities of her character and position, have been minutely described by her English physician, Dr. Madden, who published anonymously *Memoirs of Lady Hester Stanhope* (3 vols. Lond. 1845) and *Travels of Lady Hester Stanhope* (Lond. 1846); and almost every traveller on the Lebanon from Lamartine downwards has added some detail or other to the picture. The *Memoirs* were translated into German by Birsch (3 vols. Stuttg.). See also Ph. Chasles, *Lady H. Stanhope*, in *Revue des Deux Mondes* (1845).—**Philip Henry, Earl S.**, nephew of the preceding, was the only son of Philip Henry, fourth earl, and Katharine, daughter of the first Lord Carrington. He was born at Walmer, January 31, 1805; took his B.A. at Oxford, 1827; entered the House of Commons, 1830; was Under-Secretary of State for Foreign Affairs in Peel's first ministry, 1834-35; and served as Secretary to the Board of Control during the last year of Peel's second Ministry, 1845-46. Having lost his seat in 1852 in consequence of his maintenance of the old Navigation Laws, he did not return to parliament till he succeeded his father in the House of Lords in 1855; and after that date he acted as a moderate Conservative and usually voted with his party. His name is more immediately associated with the Copyright Act of 1842, which indeed is known as Lord Mahon's Act, and with the Act (1858) for the removal from the liturgy of the objectionable petitions about Charles I., &c. To him we are largely indebted for the founding of the National Portrait Gallery; and he did good service as trustee of the British Museum, president of the Corporation of the Liturgy Fund, president of the Society of Antiquarians (1846), and Lord Rector of the University of Aberdeen (1858). He died at Merivale House, Bournemouth, December 22, 1875. Lord Mahon—for it is by this courtesy title that he is best known in literature—was one of the few members of the English peerage who have regularly devoted themselves to literary pursuits. In 1829 he published a *Life of Belisarius*; in 1832 a *History of the War of Succession in Spain*; in 1836-54 a *History of England from the Peace of Utrecht to the Peace of Versailles*, 1713-83 (7 vols.); in 1842 an *Essai sur la Vie du Grand Condé* (Eng. trans. 1845); in 1849 *Historical Essays from the Quarterly Review*; and in 1861-62 a *Life of Pitt*. Under the title of *Spain under Charles II.* he published in 1844 extracts from the correspondence of Hon. A. Stanhope; in 1845-53 he edited the letters of Lord Chesterfield, and 1856-57 he was joint editor with Mr. Cardwell of Sir Robert Peel's Memoirs. As a historian Lord Mahon is careful and impartial, and always strives to give a calm and honest representation of facts. His *History of England* is the standard work on the period, and has found equal popularity on both sides of the Atlantic.

Stanislau', a town of Austrian Galicia, on the river Bistritza, 78 miles S.S.E. of Lemberg by rail. It has a gymnasium and a castle (formerly fortified), manufactures machinery, and carries on a considerable trade in corn and cattle. Pop. (1870) 14,479.

Stan'ley, Arthur Penrhyn, son of the late Bishop of Norwich, was born at Alderley, Cheshire, December 13, 1815, and educated at Rugby under Dr. Arnold (1829-34). As a scholar of Balliol, he gained the Newdigate, Ireland, and other university distinctions, took a first class in classics (1837), and was elected fellow of University College (1840). Taking orders, he was for twelve years tutor of his college, Select Preacher (1845-46), secretary to the Oxford University Commission (1850-52), canon of Canterbury (1851-58), Regius Professor of Ecclesiastical History and canon of Christ Church (1858-64), in 1863 declined the archbishopric of Dublin, and became next year the Dean of Westminster. St. Andrews University conferred on him the degree of LL.D. (1871), and he was installed its rector (1875). He made a tour in the East (1852-53), and again as chaplain to the Prince of Wales (1862), performed the Protestant marriage of the Duke of Edinburgh at St. Petersburg (1874), and visited the United States (1878). The leader since Maurice's death of the 'Broad Church' party, S. has shown his sympathies with free thought by his action in the *Essays and Reviews* and Colenso controversies, by his presence at the second 'Old Catholic' Congress, by invitations to Dissenters and Max

Müller to preach or lecture in the Abbey. Amongst his numerous publications are the *Life of Arnold* (1844; 9th ed. 1875), *Sermons and Essays on the Apostolic Age* (1846; 3d ed. 1874), *Memoir of Bishop S.* (1850), *Epistles to the Corinthians, with Notes and Dissertations* (1854; 4th ed. 1876), *Historical Memorials of Canterbury Cathedral* (1854; 6th ed. 1872), *Sinai and Palestine* (1855; 20th ed. 1874), *Lectures on the Eastern Church* (1861; 4th ed. 1869), *Lectures on the Jewish Church* (3 series, 1862-75; 7th ed. 1877), *Historical Memorials of Westminster Abbey* (1867; 4th ed. 1874), *Essays on Questions of Church and State from 1850 to 1870* (1870), *The Athanasian Creed* (1871), *Lectures on the Church of Scotland* (1872), and *Addresses and Sermons at St. Andrews* (1877). He married in 1863 Lady Augusta Bruce, daughter of the seventh Earl of Elgin, who was born 3d April 1822, resided constantly with Queen Victoria (1846-63), and died at the Deanery, Westminster, 1st March 1876.

Stan'ley, Henry M., a celebrated African explorer, was born of humble parentage near Denbigh, Wales, in 1840. An inmate of the poorhouse till his thirteenth year, he subsequently taught for a while in a primary school, and then sailed as cabin-boy to New Orleans, where he was adopted by a merchant, whose name he took in place of his own—John Rowlands. His benefactor dying intestate, he joined the Confederate army, and was taken prisoner, but volunteered in the United States navy, and became acting ensign on an ironclad. As a newspaper correspondent he travelled in Turkey and Asia Minor, and represented the *New York Herald* on the occasion of the British expedition to Abyssinia (1868), his letters appearing separately under the title *Coomassie* and *Magdala* (1874). He spent part of 1869 in Spain, whence he was summoned by the *Herald* to head an expedition in search of Livingstone (q. v.). Starting from Zanzibar in March 1871 with a company of 192 men, he pushed vigorously into the interior, and in November, at Ujiji, on Lake Tanganyika, discovered Livingstone, whom he furnished with supplies. After exploring the N. end of the lake in company with the veteran traveller, S. set out in March 1872 for England, where he arrived in July, when he published *How I Found Livingstone* (Lond. and New York 1872). Among other marks of distinction, he received a gold, diamond-set snuff-box from the Queen, and the patrons' medal from the Royal Geographical Society (1873). At the joint expense of the *Herald* and the *Daily Telegraph* he was again despatched to equatorial Africa, commissioned to settle the question of the doubted unity of the Victoria Nyanza, the problem of the Tanganyika's outlet, and that of the destination of Livingstone's great river the Lualaba. Leaving Zanzibar, 11th November 1874, with a company of 356 souls, he advanced, like Burton, Speke, and Cameron, through the pastoral lands of Ugogo, and those of the inhospitable Urimi. The expedition sighted the great Uusukuma Sea, the Victoria Nyanza, 26th January 1876, but by the time its shores were reached, the company was reduced by the death and desertion of 194 men. In a portable boat S. circumnavigated Nyanza, the width of which each way exceeds that of the North Sea between the Lincoln coast and Holland, and which has an area of 21,500 sq. miles. He thus confirmed the hypothesis of Speke and Grant, that the lake was a single sheet of water, and not a cluster of lagoons as supposed by Burton and Livingstone, while he added the fact that the Shimeeyu is the most southerly affluent of this great fountain of the Nile. S. was received in a princely manner by M'tesa of Uganda, the 'emperor of equatorial Africa,' whom he induced to renounce Islam in favour of Christianity, and to whose request for missionaries the Church Missionary Society responded in 1878. A minute account is given in S.'s narrative of Uganda (q. v.), a kingdom that is likely to play an important part in the civilisation of the interior. While exploring the lake, S. was involved in 'the affair of Bambireh,' which on his return led to much controversy. Leaving Uganda, escorted by several thousands of M'tesa's warriors, he pushed W. through hostile Unyoro, and reached the cliff shores of Muta Nzige (the native name of Albert Nyanza), but the defection of his Waganda followers forced him to retire without launching his boat. Till his return, S. believed that at this point, close to the equator, he had touched a southern gulf of Albert Nyanza, but the more recent explorations of the Egyptian Staff have shown that he had discovered another lake, separated from the former by a full degree of latitude. If the Muta Nzige drains into Victoria Nyanza, a point not yet settled, it is in all probability the highest reservoir of the Nile. Passing through the land of the gentle old king Ruminika and the warrior chief Mirambo, S. circumnavigated Lake Tanganyika (q. v.), and everywhere found evidences of its rising. His ingenious solution of the drainage problem is based on a belief that the Lakuga, discovered by Cameron, is about to resume its old function of carrying off the surplus waters westward to the Congo. Turning to his final and greatest task, S. rapidly marched to Nyangwe, an Arab station on the Lualaba, where Livingstone and Cameron were alike defeated by the want of canoes. With 400 Arabs S. began the arduous descent of the river, which he re-named the 'Livingstone.' For 200 miles from Lake Bemba he found that it skirts the mountains which shut in Tanganyika, and drains the entire western versant of the lake region as far as 4° N. lat. At the equator it flows N.W. in a lower bed, and is joined by the Aruwini (the Welle of Schweinfurth) and the Kaseye, the greatest of all the affluents. A little E. of long. 18° the river becomes identified with the Kwango of European maps, and beyond 17° occur the series of falls which interrupt the navigation of the Lower Congo, and in which the descent is 585 feet in 180 miles. S. reports that for about 780 miles the Livingstone is continuously navigable, so that the construction of a portage or canal from Emboma to beyond the rapids would open the interior to commerce. Above the falls the country is thickly populated, and many of the tribes are reputed to be cannibal. The people are engrossed in trade, and possess enormous supplies of ivory, besides abundance of cotton, indiarubber, ground-nuts, sessamum, copal, palm-kernels, &c. In his progress through the region, S. fought thirty-one 'battles,' and lost thirty-five men, while many of his followers reached the coast stricken with dysentery, ulcers, and scurvy. The narrative of this remarkable journey, *Through the Dark Continent* (2 vols. Lond. 1878), is at once a vivid, exhaustive account of strange lands, and a stirring tale of adventure and hairbreadth escapes without parallel in the history of discovery. If not entitled to rank as a scientific explorer, S. has shown the possession of rare powers of courage, determination, generalship, and enterprise. He has done, as Colonel Yule says, 'the greatest feat in the history of discovery' in unveiling the great wilderness of Western Africa. Welcomed by the Geographical Society in February 16, 1878, he received the medal of the *Société Géographique* in June. The materials collected by him in the midst of constant danger and distress are far from being wholly embodied in his published narrative, which is to be followed by a volume dealing with Central African hydrography, ethnology, and natural history.

Stan'ley, Thomas, an English scholar of great repute in his day, was born at Cumberlow, in Hertfordshire, in 1625, educated at Pembroke Hall, Cambridge, and entered the Middle Temple. Between 1655 and 1662 S. published his *History of Philosophy* in three parts, still a useful storehouse of facts, the best edition of which is that of 1743, with a life of the author. In 1663 appeared his edition of *Æschylus* with a Latin translation and commentary, a work long since superseded. He published also various poems and translations from classical and Continental authors. He died in London, April 12, 1678. See the *Life* prefixed to Brydges' edition of *S.'s Poems* (Lond. 1814-15).

Stann'ary (Lat. *stannum*, 'tin'), a term variously applied to a tin-mine, the tin-mines of a collective district, or the royal rights relating to such. The S.-Courts of Cornwall and Devonshire were founded in the middle of the 13th c., and confirmed by Edward I. in 1305. They administer justice among the 'tinners' of those counties, who claim to be exempt from all other jurisdiction, save in matters affecting land, life, or limb. The Prince of Wales, as Duke of Cornwall since 1337, is Lord Warden of the Stannaries, and a Vice-Warden, usually a barrister, presides over the courts still held at Truro, where also the last 'S. Parliament' was held in 1752.

Stann'ic Acid. See TIN.

Stanovoi'. See SIBERIA.

Stans'field, Clarkson, an English landscape-painter, born of Irish parentage, at Sunderland, in 1793. During a roving youth spent at sea he came in casual contact with Douglas Jerrold, and procured the lasting friendship of Captain Marryat,

who early appreciated his artistic powers. He was latterly engaged as captain's clerk on board a man-of-war's-man, but in consequence of a fall from the fore-topgallant mast-head retired from the navy, and procured employment as a scene-painter first at the Edinburgh Theatre-Royal (where he formed a life-long intimacy with David Roberts), then at the Old Royalty, London, and eventually at Drury Lane. After the success of the first picture he exhibited at the British Institution in 1826—'Market-boats on the Scheldt'—he devoted himself more and more to easel-painting. In 1828 he obtained a prize of fifty guineas from the Institution, in 1832 was made A.R.A., and R.A. three years later. Together with Roberts and others he established the Society of British Artists in 1830. Among his more famous pieces are 'Wreckers off Fort Rouge,' 'A Calm at Sea,' 'Mount St. Michael,' 'Views of Venice,' 'Battle of Trafalgar,' 'Battle of Ischia,' 'The Abandoned,' 'Against Wind and Tide,' 'Siege of St. Sebastian,' 'The Bass Rock.' Frequent visits to the Continent supplied S.'s ready brush with such a variety of subjects that his work never sank into sameness. Although one of the most fertile and effective of scene-painters, his art is characterised by elaboration rather than breadth, and its fidelity to nature, delicacy of finish, and harmony of colour, have obtained for S. the name of 'the English Vandervelde.' Ruskin says that one of his works shows 'as much concentrated knowledge of sea and sky as, diluted, would have lasted any one of the old masters for life.' He died at Hampstead, 18th May 1866. A volume of his engraved works was published by Messrs. Virtue & Co. in 1873.

Stan'ton, Edwin M'Masters, a United States lawyer and statesman, was born at Steubenville, Ohio, December 19, 1814. Admitted to the bar in 1836, he rose rapidly to the head of his profession, and while acting in California in 1858 as counsel for the United States in certain important land cases, he did good service to students of history by collecting a large mass of documents relating to Mexican affairs. In 1860 S. was appointed by Buchanan Attorney-General, and in 1862 he became Secretary of War under Lincoln. In this capacity he showed a zeal and prudence so strongly appreciated by the nation, that when in 1867 he was requested by President Johnstone to resign his portfolio, the Senate refused to concur in the suspension, and the unseemly strife was only ended in May 1868 by S.'s voluntary resignation. On December 20, 1869, he was nominated by President Grant associate justice of the United States supreme court; but his incessant labours had undermined his health, and he died on December 24 of the same year.

Stan'za (Ital. *estancia*, 'a room,' from Lat. *stare*, 'to stand'), a group of verses forming a complete period or followed at least by a rest, and presenting in metre, rhymes, and the number of its lines, a combination which repeats itself several times in the course of the same poem. The S. is variously termed *terzina*, *quartetto* (quadrain), *sestina*, *ottava*, &c., according as it consists of three, four, six, or eight lines. Dante quaintly ascribed the origin of the name to the fact that a S. is the *storeroom* of a song, in which the poet's art is concentrated.

Stape'lia. See CARRION-FLOWERS.

Staphyle'a. See BLADDER-NUT.

Staphylo'ma (Gr. *staphylē*, 'a bunch of grapes') is a term used in medicine, by oculists, to denote any protrusion on the anterior surface of the eye. In cases of perforating ulceration of the cornea, the cicatrix, formed in the first instance by the iris, which falls against the opening and becomes adherent to it, has a tendency from its want of firmness to bulge out under the pressure of the ocular muscles, and the resulting protrusion is called a S. In cases of complete S., it is usually necessary to remove it to make room for the insertion of an artificial eye.

Sta'ple (Old Eng. and Ger. *stapel*, 'a heap,' 'a mart'), a term formerly denoting a market-place where certain kinds of merchandise were brought together for sale; in this sense it occurs in the local names Dunstable, Barnstaple, and, in France, Etaples. It is now applied to the leading production or industry of a place; thus we say straw-plait is the S. of Dunstable. Commerce was largely controlled in medieval times by statutes; marts were fixed for certain commodities, on which dues were levied and the prices regulated. Statutes relating to the S. of wool, hides, leather, butter, lead, tin, &c., were passed by Edward III. and subsequent monarchs. The S. of wool was fixed at Brabant in 1336, at Bruges in 1341, and at Calais in 1348. Merchants attending the marts, while subject to restrictions, enjoyed peculiar privileges. 'Merchants of the S.' is the name of a society of merchants instituted in 1248 for the export of the S. goods of the kingdom. The length of textile fibres, as cotton, flax, and wool, is now spoken of as the 'S.'

Star, in heraldry, an ensign common to all orders of knights, usually having six wavy points or rays. When the rays are more than six, they are alternately wavy and straight.

Starai'a-Russa, a town of Russia, government of Novgorod, on the Polista, 185 miles S.S.E. of St. Petersburg by rail, has an imperial palace and celebrated salt-springs. Pop. (1870) 8700, greatly increased by occasional visitors.

Star Anise. See ILLICIUM and ANISE.

Star Apple is a name applied to the fruit of *Chrysophyllum Cainito* of the W. Indies (where it is used as a table-fruit) on account of its being of the size of a large apple, and when cut through showing the seed-cells arranged in a starlike form around the centre. The genus, which belongs to *Sapotaceæ*, consists of trees or large shrubs with milky juice. Its botanical name is derived from the *golden* colour of the under *leaf*-surface.

Star'board (Old Eng. *steórbórd*, from *steóran*, 'to steer,' and *bórd*, 'board,' 'side'), the right-hand side of a ship, to one looking towards the bow.

Starch, Preparation of. Starch is a definite chemical principle which occurs in great abundance in the vegetable kingdom, being found at one time or other in all flowering plants. It is found most abundantly in those parts of plants connected with reproduction and propagation, being the largest constituent of farinaceous seeds like those of cereals and pulses, and of tuberous roots such as the potato and the cassava and arrowroot plants, and it also gorges the stems of certain palm-trees, especially at the period when they are about to flower. It is only from those sources where it is present in large quantity that commercial varieties of starch are obtained. Having regard to the purposes to which starch is applied, the various kinds may be divided into (1) starches used for food and (2) starches used for laundry and industrial purposes, although certain kinds are extensively used under both of these heads. In their chemical relations all varieties of starch are identical, but in their physical constitution and microscopic structure they present marked differences among each other, and they also vary much as regards digestibility and suitableness as articles of food. Seen under the microscope, the various kinds of starch present the appearance of minute granules made up of a series of layers concentrically surrounding one or sometimes more nuclei. The size of these granules and the arrangement of layers differ in every different species of plant, and therefore the source of any particular starch is readily determined by microscopic examination.

The food starches embrace arrowroot, tous-les-mois, sago, and tapioca, all of which are described under their own headings, and under that head is also placed the so-called 'corn-flour,' which under a variety of names, such as 'Oswego flour,' 'maizena,' &c., is sold for use in the same manner as arrowroot. Corn-flour, which has now an enormous sale, is simply the starch of Indian corn or maize separated from the grain by prolonged steeping in water, crushing the swelled grains between cylinders under a flow of water, and washing the mass through a cylindrical sieve so as to separate out the husky matter. The milk-like fluid which contains the starch in suspension is run along a series of gently inclined surfaces, on which the heavier granules are deposited, the lighter and finer particles being carried with nitrogenous matter into settling-tanks. The deposit which accumulates in the settling-tank is purified by repeated straining and settling, and the separated starch is dried by gentle artificial heat, when it crumbles to a powder, and as such it is packed up for use.

The principal sources of starch for industrial purposes are potatoes, wheat, and rice, but sago starch is also extensively employed for other than food purposes; and as very many plants yield the substance, so it is found that starch, from many different substances, finds occasional or limited employment. As potatoes affected by disease yield as pure and useful a starch

as sound tubers, the preparation of potato starch was prosecuted on a great scale in the United Kingdom during the years when potato disease prevailed. In ordinary seasons the trade is more restricted, but on the Continent—in Germany, Holland, and Russia especially—the manufacture is one of importance. On a small scale the P. of S. from potatoes is a simple operation. The tubers have simply to be thoroughly steeped and washed to free them from all earthy impurity, then rasped down to a fine pulp in a tub of water and allowed to settle, when the starch will fall to the bottom and the greater part of the skin or husk will float on the water. By repeated washing and settling of the starchy deposit the starch may be obtained in a condition of purity, and it may then be dried by gentle heat for preservation and use. On the manufacturing scale machinery of various kinds is adapted for performing the several processes of steeping and washing, straining out of stones, rasping, straining, settling, purifying, draining, and drying which the potatoes undergo. Beyond its use in industrial pursuits in common with other starches, potato starch is much employed for making imitation sago, for adulterating and as a substitute for the more costly food starches, for preparing starch sugar, and as a source of potato spirit.

Wheat starch is prepared by two distinct processes. The first and old method—the grain is subjected to a process of fermentation whereby the gluten or nitrogenous constituent of the wheat is rendered soluble and the remainder of it loses its adhesive property, and in this condition the starch is easily separated out by a washing wheel or drum. By this process the greater part of the gluten is wasted, and a smaller yield of starch is obtained than can be secured by the more recent system of Martin. The principle upon which it proceeds can be easily illustrated by making a dough of flour, placing it in a muslin bag, and squeezing it under the water, when the starch exudes mingling with the water and settling as a sediment, leaving within the muslin a grey semi-elastic mass consisting chiefly of gluten. In this way the gluten is saved, and can be utilised for cattle-feeding, &c. By whatever process prepared, wheaten starch is purified by repeated washing and settling, and dried by gentle heat, and on drying it assumes the columnar structure by which it is familiarly known. In the preparation of rice starch, a variety preferred for laundry purposes, the grain has to be steeped in a slightly alkaline solution on account of its peculiarly hard and horny structure. In addition to being most extensively used in laundries, starch is largely consumed in the manufacture of Dextrine (q. v.) or British gum, and it is also employed as a thickener in calico-printing, and in the finishing of bleached and printed calicoes. A paste of starch is generally used by photographers for mounting prints, and it finds a valuable minor adaptation in dusting moulds in metal-casting, besides being applied for many miscellaneous purposes.

Medicinal Properties of S.—Wheat S. is employed in medicine as an external application to the face and hands when affected by cutaneous eruptions, and to prevent the chafing of the skin of infants. Violet powder used in such cases is merely scented S. The pharmaceutical preparations of S. are the glycerine and the mucilage. The *glycerine*, an opaque, soft, solid jelly, is composed of one part of S. and eight of glycerine, prepared by rubbing them well together, heating the mixture gradually to 240°, and stirring until a translucent jelly is formed. The *mucilage* is prepared by boiling and stirring for a few minutes one part of S. and forty of water, and is used in enemas, and in surgery to stiffen bandages for fractures, &c.

Star-Chamber, a court whose name, popularly ascribed to the gilded stars studding the roof of the room in which it sat, is derived by Mr. Green from the Jewish bonds (Heb. *starrs*) deposited for safety by the Conqueror in a chamber of the royal palace at Westminster. Originally a committee of the Privy Council (q. v.), this court was remodelled by statutes 3 Henry VII. and 21 Henry VIII., thenceforth consisting of four high officers of state, with power to add to their number a bishop and temporal lord of the council, and of two justices of the courts of Westminster. Their jurisdiction, extending over riots, perjury, and other notorious misdemeanours contrary to the law of the land, was exempt from the intervention of a jury, and they could inflict any punishment short of death. Thus constituted by Wolsey to check the power of the nobles, the S.-C. was greatly developed during the Tudor and two first Stuart reigns; under Charles I. its scope was extended to cases properly belonging to the courts of common law, solely for the purpose of levying fines; and the arbitrary nature of its sentences was experienced by opponents of ship-money, their cruelty by Leighton, Prynne, Bastwick, &c. Even Clarendon owns that 'never were the foundations of right more in danger to be destroyed;' and one of the first acts of the Long Parliament in 1640 was summarily to abolish the S.-C. along with its fellow the Court of High Commission. See S. R. Gardiner's *Personal Government of Charles I.* (Lond. 1877).

Star'-Fish, the name applied generally to various members of the class *Echinodermata* (q. v.) from the form of the body. The true and typical star-fishes belong to the order *Asteroidea*, in which the rays are parts of the body, and contain prolongations of the viscera. The body is supported by an internal skeleton of calcareous nature, and the mouth, which wants a dental apparatus, is placed in the centre of the inferior surface. There are numerous feet on the under surface, each being a muscular tube provided with a terminal sucker, and capable of being distended with water or retracted at will. The common S.-F. (*Uraster rubens*), also named the 'Five Fingers' and 'Cross-fish,' has five rays, which are capable of being reproduced when mutilated or destroyed. The common sun-star (*Solaster rapposa*) is distinguished by having numerous arms, varying from 13 to 16 in number. Certain genera of S.-F. known as *Brittle Stars* and as *Sand Stars* belong to the order *Ophiuroidea* (q. v.).

Star'-fort, a fieldwork in the shape of a polygon, constructed so that a cross fire may be brought upon the ground before any of its angles. Its defects are the room taken up by the angles and the diminishing of the length of the faces of the fort, and consequently the quantity of the fire from each.

Star'gard (Slav. *Starograd* or *Starigrod*, 'old town'), an interesting town of E. Pomerania, Prussia, on the navigable Ilna, 25 miles E.S.E. of Stettin by rail. Its well-preserved walls are surmounted by handsome towers, and its chief buildings are the Gothic Marienkirche of the 16th c., with richly adorned interior, a Rathhaus of the 11th c., the quaint Protzensche Haus, and a higher Burgerschule of 1860. It manufactures woollens, linens, leather, &c., and trades in grain and cattle. Pop. (1875) 20,173. S., destroyed by the Poles in 1120, was raised to the rank of a town in 1229, joined the Hanseatic League, and was strongly fortified. It played an important part in the Thirty Years' War.—**S.**, or **Preussisch-S.**, in the province of Prussia, on the Ferse, 30 miles S. of Danzig, has some trade in linen, cattle, iron, &c., and a pop. (1875) of 6022. Built in 1339, it was taken by the Teutonic knights in 1461, frequently besieged by the Poles, and seized by the Swedes in 1655. See Stadie, *Geschichte der Stadt S.* (Starg. 1864).

Star'let, a name given to certain species of Starfishes. A good example is the Gibbous S. (*Asterina gibbosa*), in which the rays are united by an intervening membrane.

Star'ling (*Sturnus*), a genus of Insessorial birds belonging to the family *Sturnidæ*, and to the section *Conirostres* (q. v.). It has a compressed straight bill, pointed wings, and a short tail. The tarsi are broadly scaled in front, and the nostrils are in membranous grooves. The first wing-quill is rudimentary, the second being the longest. The common S. (*S. vulgaris*) is of a dark-green colour glossed with purple, the shoulders being brown and the plumage generally spotted with buff. The plumage of the first year is brown or grey. The nest is built in trees, and the eggs, which usually number five, are of a pale-bluish tint. The food consists of insects. Starlings are gregarious. Their voice is harsh and unmelodious, but they may be taught to mimic sounds, and pronounce words with great clearness. Bold and wary, they often alight on the backs of cattle and sheep, to procure the insect larvæ which burrow in the skin, and also wool for their nests. The common S. occurs in Europe, Africa, and in Asia and Japan. The *S. unicolor* has a limited European distribution, and occurs in Sardinia. The Redwinged S. belongs to the genus *Agelaius*. It is the *A. Phœniceus* of naturalists, and occurs in America, where it is very destructive to the corn crops. The *Sturnus Ludovicianus* is known as the American S., and also as the Meadow Lark.

Star'lings, in architecture, are structures of piles driven round the piers of a bridge for their defence and support.

Star'nosed Mole, or **Starnose** (*Condylura*), a genus of *Talpidæ* or Moles (q. v.) inhabiting Canada, and of which the *C. cristata* is the familiar species. The name is derived from the peculiar form of the snout, which ends in a cartilaginous tip, composed of rays or arms arranged in a starlike form.

Starodub (Slav. 'old oak-tree'), a town of Russia, government of Tchernigov, on the Bodenez, an affluent of the Dnieper, 85 miles S.W. of Briansk, the nearest railway station. It is the centre of a rich agricultural district, but its trade is checked by the difficulties of transit. Pop. (1870) 13,652.

Star of Bethlehem is *Ornithogalum umbellatum* (a bulbous plant of the Lily family), so called from its white stellate flowers resembling the figures in old pictures of the Nativity star (St. Matt. ii. 2, 9, 10). The species is common in many parts of Europe, extending to Armenia and Palestine. In Britain the S. of B. is an old-established garden favourite, which has resulted in its becoming naturalised here and there in meadows and copses. *Ornithogalum* numbers 73 species, divided into seven sub-genera, of which two are exclusively European and Oriental, two are exclusively Cape, and three other mainly Cape. A few species are found in tropical America, one only Peruvian and Chilian, and none E. Indian, E. Asiatic, or Australasian.

Star of India. The most exalted order of the S. of I. was instituted by Queen Victoria by letters patent under the Great Seal in February 1861, in order to afford to the princes, chiefs, and people of her Indian Empire a testimony of her royal regard, and to commemorate her resolution to take upon herself the government of that portion of the empire. The order has been remodelled in 1866, 1875, and 1876. It now consists of the sovereign; a grand master, who is the viceroy for the time being; 30 knights grand commanders, or G.C.S.I.; 72 knights commanders, or K.C.S.I.; and 144 companions, or C.S.I., together with such extra and honorary knights as the sovereign may appoint. The insignia are a jewel containing a medallion of the queen, with the motto 'Heaven's light our guide,' surmounted by a star and suspended by a gold collar. The colour of the robe is light blue, with silver border. Native and European officials are alike eligible for the order; and a Mohammedan lady, the Begum of Bhopal, is a distinguished member. Foreign personages connected with the East receive honorary knighthood. Two Grand Chapters have been held in India by the Duke of Edinburgh and the Prince of Wales, on which occasions the pomp of mediæval pageantry was elaborately imitated. Each G.C.S.I. had a pavilion with a pennon and an esquire; he was preceded by six men-at-arms and a standard-bearer, and his train was borne by two pages in gorgeous attire.

Stars are the self-luminous bodies which surround our solar system on all sides. They are distinguished from the planets by their flickering light, by the comparative constancy of their relative positions in space, and by their inappreciable diameter even when viewed by the most powerful optical instruments. The number of stars visible to the naked eye is estimated at about 5000; and these have from an early age been grouped in Constellations (q. v.), and classified according to their brightness or magnitude. Those belonging to the first six magnitudes are visible to the naked eye; but the telescope reveals myriads which are distinguished down to the sixteenth magnitude. The earliest catalogue which has come down to us is that in Ptolemy's *Almagest*, supposed to have been compiled by Hipparchus (150 B.C.). Ptolemy gives 1030 stars, of which several cannot now be certainly identified. The catalogue of Ulugh Begh (15th c.), a son of Timur, the Tartar monarch, is founded upon Ptolemy's, but checked by careful observation and re-determination of the positions of the 1019 stars which it contains. The last important catalogue before the invention of the telescope was that of Tycho Brahe, who re-determined with still greater accuracy the positions of 1005 S. Of modern catalogues, Argelander's *Sternverzeichniss* is the largest, enumerating more than 300,000 down to the ninth magnitude, all situated between the pole and 2° S. of the equator. Gould is extending this catalogue to the southern hemisphere at the observatory of Cordoba, S. America. The large majority of stars are of constant magnitude, but there are certain, known as variable S., which vary in brightness and vary periodically. Algol, in the constellation Perseus, fluctuates between the second and fourth magnitudes in a period of about three days. Mira in the constellation Cetus is such another star, being usually invisible to the naked eye, but bursting out at intervals of eleven months with the brilliancy of a second or third magnitude star. There are many others, but their variations are not so marked, and are only recognisable by careful observation. At times, S. have suddenly appeared where none were known before. The most remarkable of these are the one described by Tycho Brahe (1572), that observed by Kepler (1604–6), and the star of 1866 which blazed out suddenly in Corona Borealis. Near the place of the first a small telescopic star now exists, and the last was entered as a ninth-magnitude star in Argelander's catalogue. The spectrum of the 1866 star as examined by Huggins consisted of a continuous spectrum crossed not only by the usual dark absorption lines, but also by bright lines which corresponded in part with the spectrum lines of hydrogen. In these outbursts, then, we recognise an action probably similar to, but on a grander scale, than the outbursts of the solar protuberances. The general similarity of the stellar spectra to the solar spectrum is a convincing proof, if any further were needed, that our sun is a star, and that S. are suns with a probable retinue of accompanying planets. According to the nature of their spectra, S. have been grouped under four types. Type I., of which Sirius, the brightest known star, is a good representative, is characterised by a continuous spectrum with a very few absorption lines crossing it; in Type II. the spectrum is crossed by numerous fine lines, as in the sun's spectrum; in Type III., to which α Orionis and α Herculis belong, fluted spaces begin to appear; and in Type IV., which includes the *red S.*, fluted spaces only exist. Here there is an evident gradation from the spectrum of few absorption lines to that broken by gaps. According to the accepted theory of spectrum analysis, the former spectrum indicates a higher temperature than the latter, so that here we have an evidence of a development in time of each individual star. As a star is cooling, its spectrum passes through all these types, and thus our sun is at a later stage in its life-history than Sirius, though it may not be really any older, since it is probably much smaller than Sirius, whose development will therefore be slower. Our sun, indeed, cannot be compared in size or splendour to some of its distant compeers, not a few of which must present peculiarly complicated systems. Thus the telescope reveals many S. to be really double. This may be due to the fact that two S. happen to be in nearly the same straight line with the earth; but by careful observation over many years, it has been established that many of these double S. are physically connected, just as our own earth and the moon are, the one component revolving round the other in a definite period. Comparison of Herschel's observations with the elder Struve's, and of his with the younger Struve's, has proved this beyond a doubt, and observation is constantly adding to our list of real binary S. One of the most interesting of these is Sirius, from the irregularity of whose movements Peters and Anwers had concluded that it was accompanied by an attendant star or at least a large planet; and in 1862 such a companion was discovered by the younger Clark in the very direction in which theory had predicted it to be at that time. Its great minuteness renders detection hopeless except in very favourable circumstances. The motions of Procyon indicate a similar doubleness, but its companion has not yet been seen. Triple and multiple S. forming one system are also not uncommon. For instance, μ Herculis, recognised as a double star by Herschel, is really a triple star, the small Herschellian companion having been resolved into two in 1856 by Alvan Clark. An interesting optical property of these binary systems is that the colour of the one component is frequently the complement of that of the other. A very remarkable double star is 61 Cygni, whose components have not perceptibly altered their relative position since the time of Struve; and yet that they are physically connected there can be little doubt, since they have both got the same large proper motion (see below). 61 Cygni is also famous as the first star whose distance from the sun was calculated directly from its parallax, *i.e.*, from the angular distance between its positions as viewed from opposite extremities of the earth's orbit. The most probable mean of the various results gives about ·5 of a second for this parallax. This, however, is not the nearest star; it is nearly twice as far away as α Centauri, which according to Henderson has a parallax of 0″·91, corresponding to a distance of 226,000 times the radius of the earth's orbit, or more than twenty millions of millions of miles (20×10^{12}). In other words, light, which travels at the rate of 236,000 miles per second, takes

nearly three years to pass from the nearest fixed star to us. The parallax of at least half the stars of the first magnitude is probably less than one-tenth of a second, so that their average distance is greater than two million radii of the earth's orbit. That the magnitude of the stars may be taken *statistically* as a measure of their relative distances is quite warrantable, and was the principle upon which Herschel, and after him Struve and others, proceeded in their speculations as to the structure of the stellar universe. For these, however, we must refer to detailed treatises upon astronomy. Though, to the naked eye, S. have probably occupied the same relative positions from the earliest of historic times, the telescope reveals that they are not strictly *fixed*. Many have appreciable proper motions, among others 61 Cygni, as was before noticed. Its annual motion is 5″·2, which is exceeded, however, by that of Groombridge 1830, a star of the seventh magnitude, whose proper motion is 7″. As a general rule, the brightest S. have the greatest proper motion, and S. below the third magnitude move only a few seconds in a hundred years. This motion in the heavens cannot be taken even as an approximate estimate of the velocity with which any star is moving, since only the portion of the real velocity which is resolved perpendicular to the line of the sight is measurable. Spectrum analysis has, however, given us a means of measuring the velocity along the line of sight. The physical meaning of the dark absorption lines which cross the spectra of the sun and S. has been pointed out under SPECTRUM ANALYSIS. They indicate the *absence* of certain rays of definite refrangibility and wave-length from the solar or stellar light which reaches us. Since each star spectrum has its own peculiar lines, these must be due to absorption by the star's own outer envelope or atmosphere. Now, exactly as ocean waves will appear shorter or longer than they really are according as the observer is sailing against or with them, so will the wave length of each individual ray be shortened or lengthened according as we approach or recede from the source of light, and each absorption line in the spectrum, corresponding as it does to a ray of definite wave-length, will be displaced towards the violet or red respectively. By comparison with the spectrum of the substance to which a determined portion of these lines corresponds, this displacement may be measured, and from its relation to the particular wave length the ratio of the relative velocity of approach or recession of the star and us to the velocity of light can be calculated. The measurement of such a minute displacement requires extreme delicacy of manipulation, and accounts for discrepancies between results arrived at by different observers. Huggins, the most trustworthy of stellar spectroscopists, assigns to the receding S. Sirius, α Orionis, and α Geminorum velocities of 20, 22, and 25 miles per second respectively; and to the approaching S. β Geminorum, α Lyrae, and Arcturus velocities of 49, 50, and 55 miles per second. To get the whole velocities of these S. relatively to our system, these *radial* velocities must be compounded with their *tangential* velocities, which can be calculated only from a knowledge of their proper motions and parallaxes. Thus Sirius has an annual motion of 1″·3, and a parallax of about 0″·2; consequently its derived tangential velocity of 20 miles per second compounded with its radial velocity gives a total velocity of 28 miles relatively to the solar system. Such applications are, however, still in their infancy, and must lead in time to more certain results. See Struve's *Etudes d'Astronomie Stellaire* (1847); Herschel's *Cape Observations* (1847); Herschel's *Outlines of Astronomy* (1849); Lockyer's *Star-Gazing, Past and Present* (1878); and Newcomb's *Popular Astronomy* (1878).

Start Point (*Start*, old English *steort*, a 'tail' or 'point'), (1) A rocky headland jutting into the English Channel, on the coast of Devonshire, 8 miles S.W. of Dartmouth, and at the entrance to Start Bay. It has an intermitting light at an elevation of 204 feet. (2) The N.E. extremity of Sandy, in the Orkneys, with a revolving light.

Star-Thistle, from its prickly involucre and leaves, is a name given to *Centaurea calcitrapa*. See CENTAUREA.

Starva'tion, or Inani'tion. The symptoms which depend on protracted abstinence from food are thus described by Rostan and Orfila:—'In the first instance, pain is felt in the stomach, which is relieved by pressure. The countenance becomes pale and livid or cadaverous; the eyes are wild and glistening, the breath hot, the mouth dry and parched, the saliva thick and sparingly secreted. An intolerable thirst supervenes, which, in all cases of attempted suicide by S., or privation of food by accident, has formed the most prominent symptom. The body becomes slowly emaciated, the eyes and cheeks sink, and the prominences of the bones are perceptible; the feeling of pain may be so intense as to give rise to delirium. There is the most complete prostration of strength, which renders a person incapable of the least exertion. After a longer or shorter period the body exhales a fetid odour, the mucous membrane of the outlets becomes sometimes red and inflamed, and death may be preceded by a fit of delirium or by convulsions.' Dr. Taylor says regarding death from S.:—'The period which it requires for an individual to perish from S. is subject to variation; it will depend materially upon the fact whether a person has had it in his power or not to take at intervals a portion of liquid, to relieve the overpowering thirst which is commonly experienced. The smallest portion of liquid, thus taken occasionally, is found to be capable of prolonging life. It is probable that in a healthy person, under perfect abstinence, death would not commonly take place in a shorter period than a week or ten days. This opinion appears to derive support from the results of those cases in which there has been abstinence owing to disease in the throat and difficulty of swallowing food. Age, sex, state of health, and the effects of exposure to cold, may accelerate or retard a fatal termination.'

Several cases of *pretended fasting* are on record, the most recent of which is that of Sarah Jacobs, the *Welsh Fasting Girl*. This girl, æt. thirteen, was said to have voluntarily abstained from food for a period of *two years*. She had kept her bed during that time—lying in it decorated as a bride, visited by hundreds of persons: in fact, she was thus publicly exhibited by her parents as a girl of miraculous powers. Her lips were moistened with water once a fortnight, but, according to her parents, no food was taken. Four professional nurses from Guy's Hospital were set to watch the girl, and the result was, that after passing through the usual stages of actual S. she died on the ninth day. In this case the only proved abstinence from food was during the last eight days of her life. See *Medical Jurisprudence*, by Dr. Taylor (Lond. 1873), and *British Medical Journal* (May 12, 1877).

Sta'ten Island, so named by the Dutch in honour of the States-General, an island forming part of the State of New York, U.S., separated from Long Island by New York Harbour and the Narrows, which are strongly fortified, and from New Jersey by the Kill van Kull on the N., S. I. Sound on the W., and Raritan Bay on the S. Its length is 14 miles, its greatest breadth 8 miles, and its area 58 sq. miles. Its scenery is rich and beautiful, and it is a favourite site for the country residences of New York merchants, &c. In its centre is the county town of Richmond. It is traversed by the S. I. Railroad, and connected with New York by a system of ferry-boats. Pop. (1870) 33,029.

Sta'ten Island is separated from Tierra del Fuego by the strait of Le Maire, and has an extreme length and breadth of 45 and 10 miles respectively. It has a precipitous and deeply-indented coast, a mountainous surface clothed with evergreen vegetation, and a very wet and stormy climate.

States, or Estates (Fr. *états*; Ger. *Stände*), the name given in politics to the different classes or castes into which the people of a country is divided for legislative purposes. 'In nearly every Western country,' says Mr. Freeman, 'the old primary Assemblies gave way to representative Assemblies, formed on the principle of E. These E. were in most countries three—the clergy, the nobles, and the commons, the commons being for the most part only the citizens of the chartered towns. In some cases, however, where there was a numerous and independent yeomanry, they also had a share in the representation. Thus in Sweden the four E., the House of Peasants being one of them, lasted, wherever the genuine constitution of the country was in force, down to within a very few years past' (1866). The history of the English E. is traced in the article PARLIAMENT, and that of the French *tiers état* in the article STATES-GENERAL It is a common error to suppose that 'the three E. of the realm' in Britain are the Crown, the Lords, and the Commons—a mistake which has probably been occasioned by the

complete legislative fusion of the two E. of the Lords Spiritual and Lords Temporal. The 'Crown' is *not* an E. at all. As democracy progresses, the distinction between the different E. is in most countries becoming gradually obliterated, while in pure democracies, such as the United States, it is non-existent. The press is sometimes known as 'the Fourth E.' in England, but this is a mere witticism.

States-General (Fr. *états généraux*), so called in contradistinction to the local *états provinciaux*, the only representative assembly of France up to the Revolution. Under the Karolings there was an annual assembly of clergy and nobles, called either the *Champ de Mars* or the *Champ de Mai*, according to the time of meeting, but it had little of a representative character. The S.-G., properly so called, was first assembled by Philippe le Bel in 1302, on the occasion of his disagreements with the Pope. It was composed of representatives of the three estates, nobles, clergy, and *tiers-état* or *bourgeoisie*. It assembled at pretty frequent intervals during the 14th c., and not so regularly in the 15th and 16th centuries, being principally occupied with financial matters, though its functions in the imposition of taxation, &c., were very undefined, and its powers were encroached on from time to time by the royal authority. It had no legislative power whatever. The last S.-G. before the famous one which heralded the Revolution was that held under Louis XIII. in 1614. From that date until the 5th May 1789, the crown absorbed the whole functions of taxation as well as of government. The S.-G. of 1789, almost immediately on its constitution, was resolved by the secession of the representatives of the *tiers-état* into the *Assemblée Nationale* (q. v.).

The name S.-G. is also applied to the legislative body of Holland, lineally descended from the Estates-General of the United Province, which took such a prominent and honourable part in the revolt of the Netherlands.

Stat'icé, a genus of upwards of sixty species of herbaceous or sub-shrubby plants belonging to the natural order *Plumbaginaceæ* (q. v.). It is chiefly indigenous in saline districts and the sea-shores of temperate climates. Four species are British. The genus is amply represented in the greenhouse and the garden by species introduced from S. and E. Europe, Central Asia, and the Canary Islands.

Stat'ics is, briefly, the dynamics of equilibrium, as Kinetics (q. v.) is the dynamics of motion. In modern phraseology they are said to make up together the science of *dynamics*, since both deal with the effects of forces. According to Newton's first and second laws of motion, change of motion in a given mass indicates the existence of a force which is in the direction in which the change of motion occurs, and is measured by the product of the mass into the rate of this change, or what is called the acceleration. Thus, a falling stone of mass M suffers a constant acceleration g per second; hence the force pulling it down, *i.e.*, its *weight*, is measured by the product Mg. While the stone is descending, the problem is one of kinetics; but when it reaches the surface of the earth its motion relatively to the earth ceases, there is no acceleration, and the problem becomes statical. We do not conclude, however, that the force which formerly produced the acceleration no longer exists; but rather that its effect is balanced by the action of an equal and opposite force, conditioned by the impenetrability of matter. This upward *pressure* is exactly equal to the downward *weight*, and there is consequent equilibrium. Similarly a mass suspended by a cord is in equilibrium under the action of its own *weight* and the *tension* of the cord. Every kinetical problem may be reduced to a statical problem by introducing into the material system forces whose effects will balance the various accelerations to which the different parts of the system are subject. This, stated mathematically, is d'Alembert's famous principle, and is a direct consequence of Newton's third law of motion. Taken in connection with the principle of work done, otherwise known as the principle of virtual velocities, it forms the complete analytical expression for all problems, kinetical or statical, bearing upon natural phenomena. The problems with which S. deals are evidently particular cases of more general kinetical problems. Strictly, then, kinetics includes S.; but it has always been found convenient to discuss them separately, taking S. first as being the simpler though logically it depends upon the former. Dealing thus with equilibrium, it is independent of the consideration of mass except indirectly in so far as *weight* is involved.

Sta'tionery, a general term for paper, pens, and ink, and all the materials connected with writing. These articles were formerly vended by a merchant now called a bookseller, but then a *stationer*, because he carried on his business in a stall or *station*.

Sta'tionery Office, in London, a sub-department of the Treasury established in 1786, the medium through which all offices at home and abroad in connection with the Government are supplied with stationery, and through which all contracts for the printing of Parliamentary papers and reports are made. There is a branch establishment at Dublin. The S. O. is presided over by a Controller. On account of the magnitude of its transactions—£680,000 was expended by the department in 1872-73—a Select Committee of the House of Commons in 1873 recommended that on the next vacancy a Controller with a 'technical knowledge of stationery and printing' should be appointed, but on the resignation of Mr. W. R. Greg in 1877 Lord Beaconsfield found the recommendation 'utterly impracticable,' as no gentleman engaged in a successful business could be got to abandon it for the post. See Hansard's *Parliamentary Debates*, June 1877. There are permanent experts in every branch of the office, including two examiners and two assistant examiners of printing and printing accounts, one examiner and one assistant examiner of paper as material, and an examiner and two assistant examiners of binding.

Sta'tions (Lat. *statio*, 'a standing,' hence 'a post' or 'guard'), were the assemblies for divine service which the early Christians held at the tombs of the martyrs, walking thereto in procession. The assemblies were held on the anniversaries of the passion of the martyrs, and the name was perhaps derived from the regular return of these days (*stato die*). The name of *stationary* days was afterwards applied, however, to the Wednesday and Friday of every week (in connection with the passion of Christ), as well as to the Saturday and Sunday; and indeed the name S. seems to have been applied generally to all assemblies for worship. It is therefore thought by some that S. was simply a military term, so many of which are used in the New Testament (*cf.* Eph. vi. 10-18), transferred to the Church, as if Christians at their services were like soldiers upon duty. In later times, when processions came to play such an important part in the ritual of the Church, S., which properly meant the assembly appointed to be held at a certain church, &c., on a certain day, or the liturgy appointed for the occasion, came to be loosely applied to the places where the procession stopped, or even to the procession itself. In the Middle Ages it became common during Passion Week (q. v.) to make dramatic representations of the Passion of Christ in the form of a procession from a supposed Mount of Olives to Mount Calvary. The different incidents in the progress were marked by pictures, statuary, &c., at points where the procession stopped and engaged in appropriate devotions. The name of **S. of the Cross** was given to the different points on this Via Calvaria, and also to the series of devotions. See Bingham, *Orig. Eccl.* (2d ed. Lond. 1726); Martigny, *Dict. des Ant. Chret.* (new ed. Par. 1877).

Statis'tics, a branch of political science which deals with all collections of facts relating to social life, and which bases economical problems on numerical calculations. In the operations of government, attempts to gather statistical information have been made in the earlier stages of the development of all civilised countries. Thus taxation was regulated by the census of the Egyptians, Jews, Greeks, and Romans. But it is only in modern times that the subject has been rated at its just importance, and that statesmen and publicists have seen the necessity of laying a tangible foundation for speculation and theory. The honour of first directing public attention to S., and of re-naming the subject, formerly called 'political arithmetic,' belongs to Gottfried Achenwall (1719-72), professor of philosophy at Gottingen. In his lectures he enunciated the fundamental principle that the laws which govern nature, and especially those affecting the moral and physical condition of man, are constant, and may be discovered in the collection and collation of large masses of data, allowing that accidental diversities neutralise each other. Von Schlözer developed and illustrated this principle effectively towards the end of the 18th c., and the increased

study of political economy supplied a motive for its application in various countries. From the close of the French revolutionary wars all the leading European states organised statistical bureaus, departments, or commissions. In England, although the first census was taken in 1801, the birth of the science of S. may be identified with the passing of the first Reform Bill, which was immediately followed by the establishment of the statistical department of the Board of Trade (1832), of a statistical section in the British Association (1833), and of the London Statistical Society (1834). France, Prussia, and Austria are famed for the method and range of their 'returns,' but they were anticipated by Belgium, the statistical department of which, formed in 1841 under the influence of Lambert Quetelet (1796-1874), has ever since been a model for other states. In England the returns of exports and imports, of shipping, trade, and railways, are supplied by the Board of Trade; those of banks and circulation by the Treasury; those of pauperism by the Poor Law Boards; those of mortality by the Registrar-General, &c. The London Statistical Society has made an important collection of facts bearing on every branch of social science, and regularly tabulates the movements of trade and finance. The value of S. consists chiefly in their supplying premisses for the calculation of an average; and as an instance of the important side-light they throw on history, we may refer to Thorold Rogers' *Agriculture and Prices in England, 1259-1793* (Lond. 1866). Parliamentary reports embodying vast masses of S. are now annually published in England, while in the United States the bureau of S. and the Treasury Department issue monthly reports. Societies entirely or in part devoted to S. are to be found in every European capital, as well as in New York, Mexico, and Rio Janeiro. In 1853, on the suggestion of Quetelet, the first international congress was held at Brussels, and such meetings have since been held triennially. Several periodicals are devoted expressly to S., *e.g.* the English *Statistical Journal* and the French *Bulletin de Statistique*. A seminary of S. was formed at Berlin in 1861, and a chair of S. in the university there in 1874. The practical value of S. in sanitary science has favoured the demand for the appointment of a special minister of S. made by Dr. Richardson and others at the Social Science Congress of 1878. See *Report of Fourth International Statistical Congress*, with introduction by Dr. Farr, and Quetelet's *Lettres sur la Theorié des Probabilités appliqué aux Sciences Moral et Politiques* (1846), and Hubner's *S. of All Countries* (Lond. 1872).

Stat'uary. See SCULPTURE.

Stat'ute. See ACT OF PARLIAMENT.

Staub'bach ('dust-stream'), a famous Swiss waterfall in Bern, 8 miles S. of Interlachen, and near Lauterbrunnen village. The rocky heights here send down some twenty brooks, the chief being S., which has a sheer descent of 980 feet. In the sunshine it presents the appearance of a transparent lace veil of 'rainbow hues,' thrown by the breeze into exquisitely beautiful ever-varying forms. Long before it reaches the ground it is dissipated in silvery spray, as its name signifies. It is described by Byron, Wordsworth, Goethe, and others.

Staun'ton, a town of the State of Virginia, United States, on a branch of the Shenandoah, 136 miles N.W. of Richmond by rail. It has twelve churches, three newspapers, and considerable hardware manufactures, and is also the site of the State Institutions for the deaf, dumb, and blind, and of the State Lunatic Asylum. Pop. (1870) 5120.

Stavro'pol, a government of Russia in Cis-Caucasia, bordering on the Caspian Sea, is in extent as large as Bavaria, but has little more than half the inhabitants of Berlin. Area, 28,000 sq. miles; pop. (1870) 437,118. For the most part flat and low, it is watered by the Kuban, Terek, and Kuma. In the N.E. the inhabitants, chiefly nomads, rear large quantities of live-stock and horses, while those in the S.W., where the soil is more fertile, cultivate wheat, millet, wine, and mulberries.—**S.** (*i.e.*, Cross-Town), the chief town, on a hill, 2000 feet high, near the Kuban, has a modern appearance, with gardens, boulevards, &c. It has considerable trade in horses, cattle, sheep, wool, skins, honey, &c. Pop. (1870) 20,927.

Stavan'ger, a town of Norway, on the Stavangerfjord, a branch of Bukkenfjord, on the S.W. coast, 187 miles W.S.W. of Christiania. Its finest building is St. Swithin's Cathedral, built in the 12th c. by Reinald of Winchester, first bishop of S., burnt in 1272, rebuilt by the middle of the 15th c., and 'restored' in 1867 at a cost of £4500. S. has two excellent harbours protected by islands, and to it belong 533 ships (6 steamers) of 33,729 tons. In 1873 there entered 346 ships (106 steamers). The exports are pyrites, copper ore, dried fish, lobsters, and mackerel preserved in ice. Till recent years the herring-fishery was the chief support of S., but shipbuilding and freight trade are now its main sources of income. Pop. (1799) 2154; (1825) 4000; (1875) 20,370.

Stay, a strong rope running from the head of one mast of a ship to another mast ('fore-and-aft S.'), or to the side of the vessel ('back-S.').

Steal'ing. See LARCENY.

Steam, in scientific language, is water in the gaseous condition. Popularly, however, the name is applied to water in a state of cloud or mist at a high temperature, such as is produced when a jet of steam comes into contact with the cold air. Thus, the cloud which is seen issuing from a vessel in which water is boiling is not simply S., but is a mixture of steam with minute drops of water, which have resulted from the condensation of the water vapour as it came into contact with the colder atmosphere. Water vapour may exist as such at ordinary temperatures, as is proved by the fact that the atmosphere is always more or less humid. At a temperature higher than 100° C., water, if under the ordinary pressure of an atmosphere, cannot exist save in the gaseous condition; and to convert water into S. requires a definite expenditure of work. The heating of water at its boiling point does not raise the temperature of the water, but transforms it rapidly into S. at the same temperature; and the number of units of heat expended in converting unit mass of water into S. is called the *latent heat* of S. Regnault has experimentally determined this latent heat to be 536, where the unit of heat is the heat which is required to raise unit mass of water 1° in temperature. In other words, nearly five and a half times as much work must be done to convert boiling water into S. as is required to raise water from 0°C. to 100°C. This quantity of energy which steam contains is utilised as a source of work in our Steam-Engine (q. v.). At higher temperatures than 100°C., S. behaves, with reference to volume, pressure, and temperature, very much as other gases do, obeying Boyle's and Charles's laws. See HEAT, WATER.

Steam-En'gine is a machine which transforms heat into useful work through the medium of steam. Like the old Caloric Engine (q. v.), and the more modern Gas-Engine (q. v.), it is a special form of heat engine, its distinctive characteristic being the employment of steam as the vehicle of the energy which is transformed into useful work. The heat which disappears in converting the water into steam is stored up in the steam as potential energy, part of which, as the steam is cooled again, reappears as energy of motion in the moving parts, while part is dissipated in the inevitable form of unavailable heat. There is thus a more or less complete cycle of operations, the heat taken in at the boiler reappearing partly as heat in the condenser; and the difference in thermal units between the heat taken in and the heat given out has its equivalent in the mechanical work which the engine does during the operation. Ultimately, of course, this working part of the energy is also retransformed into heat. Such is the general principle upon which all steam-engines work. The steam, in passing from the boiler where it has been generated to the condenser where it is cooled—and wherever this cooling, which must be that work may be, occurs, there is theoretically a condenser—evolves the energy which is partly utilised in performing useful work. The other parts of an engine are simply the mechanical contrivances by which the necessary transformation is regulated and applied. In the following historical sketch of the development of the S.-E., the more important of these contrivances will be noticed in their due course, and their functions explained.

The first notice of a machine dates from the time of Hero of Alexandria, who flourished about 250 years B.C. His *aolipile* (Gr. 'the ball of Æolus,' the god of the winds) was simply a hollow globular vessel, capable of rotating round a central axis. By heat applied below, the contained water was transformed

into steam, which escaped out of side orifices. These escape-pipes were so directed that the outrush of steam caused the vessel to rotate in the opposite direction, according to the principle of Barker's Mill (q. v.). The energy of rotation was derived from the energy stored up in the steam, which cooled as it expanded. Hero also described an engine in which water, expelled from a receiver by the pressure of steam, was simultaneously raised to a height. His inventions, however, were productive of no real practical good; and not till the dawn of the Renaissance was any further attempt made to utilise steam as a motive power. Leonardo da Vinci, that universal genius whose touch gave an impulse to every department of art, literature, and science, has left a description of a steam-gun, which he ascribed to Archimedes. The bullet was propelled by the sudden generation of steam, when the closed compartment in which water had been previously strongly heated was suddenly opened. The next information we have is of a Spaniard, Blasco de Garay, who is said to have succeeded in propelling a ship by steam in the harbour of Barcelona in the year 1543 A.D. What truth there is in the report it is difficult to say; but if a fact, it must be regarded as the first attempt at steam navigation. In the next century, however, we have three well-authenticated inventions. Giovanni Battista della Porta (1601), Solomon de Caus (1615), and the Marquis of Worcester (1663), seem to have independently applied steam to raise water. Their inventions could not have differed much from Hero's invention for a like purpose, since their construction was as simple as could well be. The principle of all was that the pressure of steam acting upon the surface of water in a closed vessel drove the liquid out at the mouth of a vertical tube whose lower extremity dipped under the water. In Savery's engine (1698), which was intended for raising water out of mines, not only was the pressure of the steam used directly to force water up, but by cooling and condensing the steam which filled the water-chamber (connected by an upward-opening valve to the cistern) the pressure in this chamber was diminished, and the chamber re-filled with water by the action of atmospheric pressure. The steam from the boiler was then again admitted, and forced the water up to the exit-pipe to a height depending upon the pressure, the return of the water being prevented by a valve. Re-condensation of the steam was followed by a re-filling of the chamber; and thus, by alternate generation and condensation of steam, water was raised to a considerable elevation. In this apparatus there was necessarily a great waste of heat; and besides, enormous steam-pressure would be required to raise the water from even a moderately deep mine. It is to be observed that, in these inventions of the 17th c., the steam is used simply to raise water, and that the ancient *aeolipile* of Hero more nearly resembles our modern S.-E. than these do. A rotatory engine, which was impelled by steam as a windmill is by the wind, was constructed by Brancas in 1629, and successfully applied to raise water in buckets, saw timber, &c. That which made an effective S.-E. a possibility, however, was the introduction of the piston by Papin in 1690. A piston is simply a rigid disc, usually circular, which fits more or less closely in a cylindrical vessel, but not too tight to prevent its to-and-fro motion. It had been long used in the various forms of suction and force pumps with or without attached valves; but Papin was undoubtedly the first to conceive the idea of working a piston by steam pressure. His method was to generate steam in the lower portion of the cylinder, and thus raise the piston. When the piston had reached its highest point, the steam in the cylinder was condensed by cooling, and the piston forced down by the atmospheric pressure upon its upper and exposed surface through the vacuum created below it. Papin proposed that such a machine should be made to work pumps, and by means of rack and pinion work drive paddle-wheels and other revolving machinery. Here, then, was the germ of the now extensive development of steam power. Besides thus inaugurating a new era in the history of the S.-E., Papin made other useful inventions, notably the Safety-Valve (q. v.), which prevents the pressure in a boiler increasing indefinitely. Succeeding Papin we have Newcomen (1713), who improved upon the engine of the former by separating the boiler altogether from the cylinder, an improvement which it is singular Papin should have missed. The down stroke of the piston was still produced by the atmospheric pressure; but the condensation of the steam was effected by introducing a jet of cold water, a method which much facilitated matters. A characteristic feature of Newcomen's engine was the *beam*, which oscillated upon a central horizontal axis about its mean horizontal position. Its extremities were expanded in the form of circular arcs, to the upper extremity of each of which a chain was attached. The one chain was fastened to the piston, the other to the pump-rod by which the pump was to be worked. The pump-rod extremity of the beam was heavier than the piston extremity, so that when the engine was at rest the piston was at its highest point. Matters being so, let steam be introduced from the boiler into the cylinder until most of the air is expelled from the latter. The communication with the boiler is now cut off, and by the same mechanical operation a stop-cock is opened which projects a jet of cold water into the cylinder, thus condensing the steam and diminishing the pressure below the piston. The piston is accordingly driven down by the pressure of the atmosphere; its end of the beam descends, the opposite end rises, and with it the pump-rod and load of water. Such is the essential action of the Newcomen engine. The water raised was taken to the tank which supplied the cold jet, and the cold jet and condensed steam in the cylinder were drained off to feed the boiler. In the original engine ceaseless attention was required to work the taps, which opened and closed the duct from the boiler, and simultaneously closed and opened the cold-jet nozzle. A Cornish lad, Potter, to save himself such trouble, attached the taps to the beam, which then did the necessary work. The valve-motion was an immediate improvement, and a self-acting engine was a reality. Since the only effectual work was done during the *down* stoke of the piston, Newcomen's engine was not strictly a *S.-E.* It was an atmospheric engine, and steam was employed not to do work directly, but only to make conditions favourable for work to be done by the atmospheric pressure. Several improvements were added by Smeaton, who first laid down rules for proportions and attempted to measure the power; but Newcomen's engine remained essentially the same till about the year 1763, when Watt appeared. Before passing on to consider the radical improvements introduced by him, we should notice Leupold's engine (1720), which was provided with two piston chambers placed side by side. The pistons, provided with rigid piston-rods, were raised alternately by the direct pressure of the steam, as had been done in Papin's engine a quarter of a century before. The novelty introduced by Leupold was in the means of condensing the steam which was simply exhausted into the atmosphere. The same movement which let the steam escape from the one cylinder cut off its supply from the boiler, but opened the duct leading from the boiler to the other cylinder.

In the year 1763 James Watt, philosophical instrument maker to the University of Glasgow, received a model of a Newcomen engine from the natural philosophy professor to repair. The difficulty he experienced in making this model work opened his eyes to the great defects of the engine, and these he proceeded to eradicate. His great improvements, as specified in his patent of 1768, were as follows: To prevent needless waste, the cylinder in which the piston worked must be kept at the temperature of the steam which came from the boiler. The exterior surface of the cylinder should therefore be covered with some badly conducting material; steam or other hot substance should circulate freely round the cylinder, between double walls for instance, and nothing of a lower temperature than the steam should be permitted to enter. Hence the steam must be drawn from the cylinder and condensed elsewhere, either in the air as in Leupold's engine, or in a separate vessel which Watt called a *condenser*. To remove from the condenser any uncondensable gases which by their presence might impede the action of the engine, Watt added pumps which were worked by the engine itself. The pressure of the steam he also purposed to use directly to move the piston, which he made steam-tight by covering it with a layer of oil or liquid fat instead of the water which had till then been universally employed. From one improvement he was led to another. Covering the cylinder above to keep out the cold air, he conceived the bold idea of making the piston work by steam-pressure alone, without any use whatever of atmospheric pressure; and thus was his *double-action* engine gradually developed. The principle of its working is simply this: The steam introduced below, after forcing the piston up, is drawn off to the condenser, where a jet of cold water is playing. At the same time, the supply of steam from the boiler is directed into the upper part of the cylinder, so that, with pressure above and vacuum below, the piston descends. This steam is in its turn

drawn off and condensed; a new supply enters below; and with pressure below and vacuum above the piston ascends. Since the up-stroke as well as the down-stroke is effective, the piston had to be attached to the beam by a rigid rod. This rod must move vertically up and down; but as certainly must the extremity of the beam describe a circular arc. How, then, to convert circular motion into rectilinear motion was a problem needing a practical solution. In the earlier engines, a rack working upon a toothed arc served the purpose. But this lacked smoothness of motion, and, besides, was necessarily accompanied by great waste. In his *parallel motion*, however, Watt surmounted the difficulty; and his ingenious mechanism is an essential part of every beam-engine. So far Watt's engine accomplished no more than Newcomen's, though it accomplished it infinitely better. Both sustained a reciprocating motion, which was specially useful for pumping water out of mines. To convert such reciprocating motion into a rotatory motion, so as to apply the engine to a variety of useful ends, was now the great problem. It also was solved by Watt. To the other extremity of the beam he applied the Crank (q. v.). True, in his own engines he was compelled for a time to adopt another device known as the 'sun-and-planet' motion, since the 'crank' had been pirated and patented by another. On the expiry of the patent, however, the superiority of the earlier invention asserted itself. To equalise the motion, the fly-wheel was subsequently added, which by its momentum carries the crank past its dead-points. (See FLY-WHEEL.) To Watt also is due the beautiful mechanism, known as the Eccentric (q. v.), which so effectually works the valves which regulate the action of the steam in the cylinder. In 1782 Watt took out a new patent, which embodied another great improvement. The steam introduced into the piston-cylinder was cut off before the piston had completed its stroke. The momentum of the piston, and the expansion of the steam in the cylinder, were sufficient to make the piston complete its stroke, which it did without coming into violent contact with the end of the cylinder. There was thus no energy lost as heat of percussion, and the chance of damaging the engine was very much lessened. The governor and indicator complete the list of Watt's most important inventions and improvements. The governor consists, in its most usual form, of two balls so suspended from a vertical shaft that they swing outwards when the shaft is rotating. For a certain position of the balls, conditioned by the rate of rotation of the shaft (*i.e.*, by the speed at which the engine is working), a connecting mechanism, which has assumed an endless variety of forms, opens a valve, thus diminishing the steam pressure and slackening the speed of the engine. The indicator consists of a small piston working in a cylinder which is fixed to the steam cylinder of the engine, and by means of a stop-cock can be put into communication with the interior of the same. When this is done, the steam pressing upon the indicator-piston raises it, and presses it against a spiral spring, so constructed that the distance through which it is compressed is proportional to the pressure which raises the piston. A pencil is attached to the piston, and presses lightly against a sheet of paper which is wrapped round a vertical cylinder capable of turning round its axis. This rotation of the cylinder is regulated by the working piston of the engine, and the angle through which it has turned at any instant is proportional to the distance through which the piston has moved from the beginning of the stroke. Hence, during a complete stroke of the piston, the indicator pencil will move up and down and back to its original position, measuring at every instant the *pressure* which drives the piston, while simultaneously the indicator-cylinder will rotate once and return, measuring at every instant the *volume* of the steam or working fluid. The pencil will thus trace upon the paper which covers the indicator-cylinder a closed curve, which not only tells us much about the action of the engine, but represents by its *area* the amount of work done by the steam at each stroke of the engine. (See Maxwell's *Theory of Heat*, chap. v., for the complete theory of the indicator.) Our condensing engine of the present day is in all essentials the same as Watt left it. True, we have altogether dispensed with the *beam*, which was so long characteristic of this type of engine; but Watt himself did not fail to see that the beam was simply an adjunct and not an essential. He however retained it as convenient for the purpose to which his engines were chiefly applied during his lifetime; that, namely, of pumping water out of mines. The subsequent application of the S.-E. to locomotion and manufacturing purposes proved the beam to be not only unnecessary but absolutely deleterious to the working of the engine. Thus in the inverted beam-engine of the *Great Western*, which crossed the Atlantic in 1838, the beam was found to be unfitted to sustain the strains which came upon it. In applying the beam-engine to navigation, the beam was first lowered so as to make the ship's centre of gravity as low as possible, as in the *side-beam* S.-E., invented by Napier of Glasgow. To make the engine more compact, the one arm of the beam was dispensed with, and this form of *lever-engine* is still to be seen on paddle-steamers. The lever, however, soon followed its predecessor; and the tendency is now to make all engines *direct-acting*, in which the piston-rod is connected directly by a rod with the crank. Of such three kinds are distinguished. In the one kind the parallelism of the piston-rod is preserved by the use of Watt's parallel motion linkage; in the second it is preserved by *guides* or sliding surface; while in the third, the *oscillatory* engine, the cylinder is hung upon pivots and follows the oscillations of the crank. The second kind is extensively used for navigation, and the last is common in the ordinary steam-crane. The position of the cylinder matters very little, but the commonest type of engine is the *horizontal* S.-E., introduced by Taylor and Martineau, in which the cylinder is set horizontally, an arrangement familiar in the ordinary locomotive of the present day. The locomotive, as it now exists, is undoubtedly due to the genius of Robert Stephenson; but before his day several successful attempts had been made to drive a vehicle along a road by steam. In 1769, Cugnot constructed a steam-carriage which carried four persons at the rate of 2 or 3 miles an hour. Oliver Evans, of the State of Maryland (1772), William Symington, best known for his early development of steam navigation (1786), and others, proposed and constructed steam-carriages; but the first really successful road-engine was Trevethick's, patented in 1802. It was a high-pressure, non-condensing engine, exhausting into the chimney, and had a horizontal cylinder and piston, with a connecting crank, working at the mid-length of an axle, which carried a fly-wheel and a pair of cog-wheels which geared into corresponding wheels on the axle of the driving-wheels. It was run upon a railway at Merthyr-Tydvil, and was the first locomotive to run upon rails, which were then constructed with projecting teeth into which cogs on the bearing wheel fitted. This contrivance was shown to be unnecessary by Hedley, whose *Puffing-Billy* (1813) was the first locomotive which ran on smooth rails. The success of the locomotive is, however, due chiefly to Stephenson, who in his *Rocket* (1829) introduced the blast-pipe and the tubular boiler, which together adapted the engine for the peculiar work it had to perform. The blast-pipe, by conveying the steam from the cylinders into the chimney, aids the draft and thus regulates the rate at which steam is produced in the boiler; while by means of the tubular boiler the surface by which heat is communicated from the fire to the water is greatly increased. It was the combination of these two improvements which gave to the *Rocket* its advantage over Hackworth's *Sanspareil*, and Braithwaite and Ericsson's *Novelty*, on the day of the famous competition, October 6, 1829. The blast-pipe Stephenson borrowed from Hackworth's engine, and the boiler was invented independently by Booth and Séguin; but to Stephenson was due their practical combination. Further, he introduced many detailed modifications and improvements, determining the best relative dimensions of the component parts, so that to him, and to his son George, we owe the development of a locomotive system which has covered the civilised world with a network of railways, has extended commerce, increased wealth, and by facilitating and encouraging travel broken down many of the barriers of national prejudice.

Since the days of Watt, who we have seen first successfully transformed reciprocating motion into rotatory motion, the problem of obtaining this rotatory motion directly has engaged the attention of many mechanicians. As yet, however, no rotary (more properly rotatory) engine has been constructed which has proved more economical than the reciprocating engine with crank attached. The rotary machine of Brancas has been already mentioned, and all later attempts have proceeded upon the same principle; that, namely, of using a piston capable of moving continually round a centre. The steam was made to act either directly, as upon Brancas' vanes, or by its reaction, as in the still older *æolipile*. Scheutz, Thomp-

son, Behren, Pillner, and Hill are names connected with the most successful of these attempts; and more recently Dudgeon, a Scotchman resident in America, has invented a rotary engine of very simple construction. It consists of two spur-wheels, whose teeth work steam-tight into each other, and whose ends work steam-tight against two side plates. The steam, introduced through one of the end plates into the cavity between two pair of teeth, press against them so as to force both wheels round in the required direction. In a certain position the steam is cut off and introduced into the next succeeding cavity, the steam in the first cavity meanwhile expanding until, when the teeth pass beyond contact with each other, it escapes. It has been impossible in the preceding historical sketch to describe in any detail the working parts of an engine. These can only be thoroughly understood by studying the engine itself or a working model. Numerous varieties of engines are annually constructed by different manufacturers, but all work upon substantially the same principles which were embodied in Watt's S.-E., and to understand one is to understand all. The total value of S.-engines, apart from other kinds of machinery exported by Great Britain, was £2,018,864 in 1877. See Rankine's *S.-E. and other Prime Movers* (1859), for the complete theory of the S.-E.; also Goodeve's *Text-Book on the S.-E.* (1878).

Steam-Hamm'er. See HAMMER.

Steam Naviga'tion. To apply steam to the propulsion of vessels occupied the attention of many before it was fairly accomplished. Blasco de Garay (1543), Denys Papin (1695), Savery (1696), and the other early engineers who studied the action of steam, proposed and even carried into execution plans for realising S. N. Papin launched a boat upon the Seine which was driven by paddles worked by steam; but the great loss of energy in his form of engine prevented the practical development of his idea. In 1730 Dr. Allen, an Englishman, suggested the use of a backwardly discharging pump; and seven years later, Jonathan Halls patented a method for propelling a ship by a stern-wheel driven by an atmospheric engine. Not till the introduction of the crank by Watt, however, could S. N. be really successful, on account of the difficulty of transforming reciprocating into rotatory motion. Still, some success was attained by Symington in 1788, when he applied a steam-engine to the pleasure-boat of Patrick Miller, of Dalswinton, to drive side-paddles. The succeeding year he constructed a steam-boat, 60 feet long, which travelled at the rate of seven miles an hour upon the Forth and Clyde Canal. In 1802 he constructed another boat, the *Charlotte Dundas*, in which he adopted Watt's double-action engine, with connecting-rod and crank, and used only one paddle-wheel placed at the stern. Meanwhile, in America, Oliver Evans had constructed a steam-driven dredging machine (1789), which navigated the Schuylkill and Delaware rivers; and in 1807 Fulton established the now extensive American steam-boat system. His *Clermont* accomplished the distance from New York to Albany in 32 hours; and he thus obtained the monopoly of the Hudson. The next year, however, Stevens' *Phœnix* steamed from New York to Philadelphia in three days, and was thus the first steamer used in ocean navigation. To Fulton is due the invention of the paddle-box; and by proportioning the size and strength of the parts he did more than any other man in introducing S. N. as a system, especially upon the great rivers of the West. In 1814 a steam man-of-war was launched under the name of *Fulton the First*. In 1812 the *Comet*, built by Bell, plied between Glasgow and Greenock; and two years later there were five steamers plying regularly in Scottish waters before one had been introduced in England. Since then, however, the development of S. N. has been extremely rapid; and in 1818 the *Savannah* (Captain Rogers) accomplished the distance between Savannah and Liverpool in 22 days, 18 of which she was propelled by steam. She was thus the first steamer to cross the Atlantic. In 1824 the *Enterprise* (Captain Johnson) doubled the Cape of Good Hope. The introduction of the Screw-Propeller (q. v.) was mainly due to Ericsson (1837). It would be impossible now to particularise any of the magnificent passenger steamers belonging to the Cunard line, the Inman line, the White Star line, the Pacific S. N. Company, the Pacific Mail Steamship Company, &c. The largest steamship ever constructed is the Great Eastern, which is 674 feet long, 77 feet broad, and has a gross tonnage of 22,500 tons. It is provided with ordinary paddle-wheels and a four-bladed screw-propeller, with engines to suit, of a total nominal horse-power of 2000. In 1877 there were registered at the 83 principal ports of Great Britain and Ireland 4552 merchant steamships, of a total tonnage of 2,136,361.

Stear'ic A'cid ($C_{18}H_{36}O_2$) is prepared by saponification with soda-lye of certain fats, such as beef or mutton suet, cacao fat, or the fat of cocculus berries. An impure form is largely prepared for the manufacture of stearin candles by saponification of the harder fats with lime. Pure S. A. is a tasteless and inodorous solid, of the same density as water at 10° C. It melts at 69°, and can be distilled without decomposing. It has a distinct acid reaction, and forms stearates which have the consistency of hard soaps and are mostly insoluble in water. Of the glyceryl stearates or stearins the most important is that having the composition $(C_3H_5)(C_{18}H_{35}O_2)_3$. It exists as the solid constituent of natural fats associated with olein. It crystallises in masses of white pearly needles, and whether prepared artificially or obtained directly from solid fats, can exist in three allotropic conditions, which differ markedly in their melting points.

Ste'atite, or **Soap'stone** (Gr. *stear*, 'fat'), a silicate of magnesia, with small and variable quantities of water, alumina, and lime. It is opaque and non-crystalline, soapy and unctuous to the touch, and grey or yellowish white in colour. It occurs abundantly in Cornwall, Greenland, and many other parts of the world, generally in connection with limestone and serpentine. Agalmatolite is a beautifully mottled variety, used in China for delicate carvings. Common soapstone is used for very numerous purposes; *e.g.*, for polishing mirrors, for marking cloth, for fulling, and for diminishing friction in machinery.

Steator'nis, or 'Fat Bird' (*S. Caripensis*), a species of *Caprimulgidæ*, or Goat-Sucker (q. v.), found in Trinidad, and so named from the fat obtained by the Indians from the young birds, which are knocked down in great quantities by long poles. The fat is melted in clay pots, and is highly valued by the natives.

Steel. Recent improvements in the metallurgical treatment of iron have so broken down all dividing lines between malleable iron, cast iron, and steel, that there is now much difficulty in defining and limiting any of these forms. S. may in a general way be defined as a variety or condition of iron capable of being melted and cast, hammered and welded, and of being tempered, or hardened and softened. It is thus in its properties intermediate between malleable and cast iron, and in its composition it also occupies a middle place between these two varieties. The proportion of carbon contained in the metal is the chief element in determining its character, cast iron containing generally from 2·5 to about 5 per cent. of carbon, S. having from ·05 to 1·80, and the proportion in malleable iron varying from ·016 up to about ·34; but there are other circumstances which also go to determine the nature and quality of any of the kinds.

The methods by which S. of various qualities are now produced are numerous, but they may all be included under these heads:—1st, The partial decarbonisation of cast iron; 2d, The addition of carbon to malleable iron; and 3d, The complete decarbonisation of pig-iron, and the addition of the necessary carbon by means of pig-iron or other kinds rich in carbon to the molten mass. By the first of these processes what are known as natural S. and puddled S. are produced. Natural S. is made from pure varieties of pig-iron (white or fusible grey pig, from spathic or magnetic ores) by melting it with charcoal on the hearth of a refining furnace, as in the corresponding operation in the manufacture of malleable iron; the operation being so controlled that it can be stopped when the desired amount of decarbonisation has been effected. Natural S., known also as Styrian or Carinthian S., from having been largely made in these provinces, was formerly in great request on the Continent for tool-making. Puddled S. is a similar but less pure product, made also direct from cast iron on the bed of a puddling furnace, the puddling being stopped before the complete oxidation of the carbon. In this process, also, the only difference from the analogous stage in malleable-iron manufacture consists in stopping the operation at an earlier stage. The S. of the famous works of Krupp at Essen is made by this process, and it is largely used for machine castings, railway wheel-tires, and other large works.

The kinds of S. produced by the imparting of carbon to malleable iron are known as cementation S., and the varieties included under this head embrace the most valuable classes of

S. The production of cementation S. depends on the fact that when malleable iron is heated to a high temperature in contact with carbonaceous matter without access of air, it absorbs carbon, and thus becomes converted into S. Bar iron of the highest quality only is used for making cementation S., and the bars are embedded in powdered charcoal, and packed in a chamber heated by a furnace. The temperature is gradually raised, and kept uniformly at a full red heat (about 2000° Fahr.) for about a week, at the end of which time the furnace is allowed to cool slowly down, which requires another fortnight. When the bars are unpacked they exhibit a surface covered with small blisters, whence the S. in this condition is called 'blister S.' To make it homogeneous, the bars are faggoted, heated to welding heat, and hammered or rolled, the resulting material being 'shear S.' When, instead of being hammered, the blister S. is melted in crucibles and cast in moulds, it forms 'crucible cast S.,' the purest of all varieties of S., and that which is principally used for files, cutlery, and fine tools generally.

Siemens-Martin S. is produced by what may be regarded as a modification of the cementation process, since in it malleable iron is carburetted by means of pig-iron or other compound rich in carbon. There is, however, in the process little in common with the cementation process, and the product is of a different class. Siemens-Martin S. is manufactured by the agency of the Siemens Regenerative Gas Furnace, and it is entirely owing to its employment that the method of S.-making which was introduced by Martin, and had been proposed by others has been rendered practicable. On the hearth of an open furnace, heated by gas on the regenerative system, a quantity of pig-iron is melted, and to that scrap iron, old rails, &c., heated to redness, are gradually added. When by the examination of test pieces it is found that the quantity of carbon is sufficiently reduced, by the addition of malleable iron, for the kind of S. required, the charge is run off. The Siemens-Martin process is also conducted in a manner modified as follows:—The pig-iron and malleable scrap are melted together, an operation which occupies from 2½ to 3 hours, and thereupon a quantity of iron ore (hæmatite) is added to the furnace, which in giving off its combined oxygen decarbonises the entire charge. When the decarbonisation is found to be complete, from 8 to 10 per cent. of spiegeliesen (or about 2 per cent. of ferro-manganese), previously raised to a red heat, is thrown into the furnace. After about ten minutes this will be thoroughly dissolved, the carbon disseminated through the mass, and the charge ready for being tapped off. S. so made is now largely used for rails, waggon wheels and axles, and it is being introduced for boilers, ships' plates, and other similar purposes.

Bessemer S. forms the subject of a separate article. S. presents physical characteristics so distinct from those of malleable iron, that it may be for practicable purposes regarded as a distinct metal. Its most remarkable physical characteristic is its power of becoming exceedingly hard by sudden cooling from a high heat, and of passing through many grades of hardness downward from that point by the process of tempering. The tempering is accomplished by re-heating the metal to a certain degree and allowing it gradually to cool, and according to the heat to which it is raised is the resulting temper, the higher the heat the softer being the S. In practice the colour which bright S. assumes as its temperature rises is a sufficient guide to the workman in tempering bright S. articles. A light straw colour indicates a heat of from 428° to 446° F., and gives the hardest temper required for lancets, &c. A full yellow 473° is employed for fine cutlery; at 509°, indicated by a purplish tinge, is the temper for ordinary cutlery obtained, and the shades of blue shown from 536° to 572° yield S. of high elasticity useful for watch-springs and similar purposes. Sir Joseph Whitworth has introduced a method of compressing with enormous force cast S. in its fluid state, and he demonstrates that thereby the tensile strength and homogeneity of the metal are increased in a remarkable manner.

In the British Mineral Statistics and the Board of Trade Returns, the manufacture of S. has not hitherto been distinguished from the ordinary statistics of iron in such a manner as to enable the progress of S.-making to be distinctly indicated by figures. The manufacture, however, of S. on the large scale has been entirely created since 1855; and during the last five years, in spite of general commercial depression, the development of the British S. industry has been greater than during any previous quinquennial period. In 1870 there were 18 Bessemer S.-works, having 85 converters, which turned out 215,000 tons; while in 1877 the production of 24 S.-works, with 110 converters, amounted to 750,000 tons,—more than a threefold increase in seven years. Messrs. Bolckow, Vaughan, & Co., who introduced Bessemer S.-making into the Cleveland district, are turning out (December 1878) at Eston about 1700 tons of S. rails weekly. They are at present on the eve of a still greater enterprise, the erection of a magnificent S.-making plant at Middlesborough, for the double purpose of discovering the best and cheapest means of making the material which is superseding iron, and achieving the dephosphorisation of Cleveland pig, so as to pave the way to the use of native Teesside iron without the mixture of more costly Spanish and other ores. The attainment of the latter object will revolutionise the whole iron industry of N. England.

In 1877, experiments at the Spandau foundry by the Achatius method, with bronze S., were so successful, that they are regarded as the first step towards the complete substitution of bronze S. for S. ordnance in the German army. In the same year satisfactory experiments were made on the Steinfeld range, near Vienna, with two 15-centimetre bronze S. guns. The United States furnishes an extraordinary example of sudden growth and expansion in the S. manufacture, in so far as the production of Bessemer S. ingots increased from 40,000 tons in 1870 to 191,933 tons in 1874, 375,517 tons in 1875, and 525,996 tons in 1876, in which year the total number of converters was only 22. It will be seen on contrasting the statistics of the two countries that the United States, with one-fourth the number of converters, produced over two-thirds of the production of Great Britain,—a fact which is partly to be ascribed to the superior mechanical appliances in use in the former country. Prussia produced, in 1876, 369,446 tons of S., France 230,828 tons (268,361 in 1877, and 130,801 in the first six months of 1878), Belgium 75,258 tons, Sweden 22,789 tons, and Russia 8500, the Bessemer process chiefly being prosecuted in all these countries. S. is rapidly taking the place of iron in the construction of certain goods for which iron was formerly used alone. On railways the change in the material for rails is already complete, while every year S. is being more and more preferred for boilers, tyres, &c. In shipbuilding S. is now practically employed for making tow-lines, and experiments are at present being made for its introduction in other ways. The Admiralty gave instructions (November 1878) for the testing of the material in the construction of a few anchors, and if, as is expected, it stands the strain, it is likely to pass into extensive use, for Bessemer S. can be produced much cheaper than the 'best' iron of which anchors are now made. See *Iron and S.*, by W. Mattieu Williams (*Brit. Industries Series*, Lond. 1875), and J. Deby, *Report on the Iron and Steel Industries in Foreign Countries* (Newcastle, 1878).

Steele, Sir Richard, the son of an Englishman in the service of the Duke of Ormond, was born in Dublin in 1671. From Charterhouse School, to which he was sent by the Duke on his father's death, he proceeded to Merton College, Oxford, in 1692; but after three years at the university he fell in love with a military life, and in spite of his friends entered the Horse Guards as private. He soon became a favourite in the regiment, and rose to be captain of a company in Lord Lucas's Fusiliers. Finding that the temptations of his position were continually leading him to excesses which his better judgment condemned, he adopted the strange device of writing an account of *The Christian Hero* and publishing it to the world, in order that the fear of being ridiculously incongruous with his own acknowledged work should act as a check on his evil propensities. His literary faculty almost immediately afterwards found a new outlet in the three comedies, *The Funeral, or Grief à la Mode* (1702), *The Tender Husband* (1703), and *The Lying Lover* (1704). These were much more in keeping with *The Christian Hero* than might be supposed, and the last indeed was 'damned for its piety'! The influence of Addison, who had been his friend from the old Charterhouse days, procured him the post of editor of the *Gazette;* and this giving him access to special sources of information, enabled him to start a little miscellany of literature and news. The first number of the *Tatler*, as it was called, appeared in April 12, 1709, and from the very commencement the deftness and daintiness of S.'s work is evident. On the accession of the Tory minis-

try the post of Gazetteer was taken from him, and in 1711 he modified the plan and scope of his magazine and began the *Spectator*. In 1713 he entered Parliament; but in spite of the support of Walpole, Stanhope, and Addison, he was expelled from the House by a large majority for accusing the ministry, in a pamphlet called the *Crisis*, of treacherous intentions in regard to the Protestant succession. The following year saw him not only appointed surveyor of the royal stables, governor of the company of comedians, and justice of peace for Middlesex, but raised to the rank of knighthood, and returned again to Parliament. As commissioner of forfeited estates he visited Scotland in 1717, and while there he endeavoured to procure a union of the Churches of England and Scotland. His second wife, the 'Dear Prue' of his letters, died in 1718, and the next year he lost the goodwill of Addison by opposing a bill to limit the number of peers. In 1722 he gained a last literary triumph by his *Conscious Lovers*; but shortly afterwards he retired to Wales, and there he died of a paralytic stroke at Llangunnor, September 1, 1729. It requires no deep analysis to discover S.'s virtues or his failings. He was generous and forgiving to a fault; his intellect was clear, and his moral sympathies unimpaired; but his emotions were easily affected, and he had no permanent sense of the necessity of what was originally meant by *conduct*. His position in our literature has been the subject of debate. In his Essay on Addison, Macaulay used him as a foil to his hero, with a partiality which S. would have been the first to condone, but which Addison would not have been the last to censure. Mr. Forster, in an anonymous article in the *Quarterly Review*, 1855 (reprinted in his *Historical Essays* 1858), entered the lists in S.'s defence, and successfully maintained his right to equal honours with his illustrious friend. To S. we are indebted for the plan of the *Tatler* and the *Spectator*: it was S. whose fancy gave birth to Sir Roger de Coverley, Will Honeycomb, and Sir Andrew Freeport; and it is no disparagement to Addison to say that the best of S.'s essays are equal to the best of Addison's. We have to thank Mrs. S. for the preservation of her husband's letters, which were published by Nichols in 1787 (2 vols.), and form one of the most remarkable collections of the kind in our literature. See H. R. Montgomery's *Memoirs of Life and Writings of Richard S.* (Lond. 1865, 2 vols.), and for minor notices, Thackeray's *English Humourists*: *Esmond*; Disraeli's *Calamities of Authors*: Theophilus Parsons in *North American Review*, x., and E. T. Channing, *ibid.* xlvi.

Steell, Sir John, a Scottish sculptor, was born at Aberdeen in 1804, and received his first artistic education in the Royal Academy, Edinburgh. On his return from Rome in 1833 his colossal model of Alexander and Bucephalus attracted attention; and from that period onwards his career has been one of distinguished success. The figure of Queen Victoria for the front of the Royal Institution in Edinburgh procured him in 1844 the title of Sculptor to her Majesty in Scotland; and after the unveiling of the national monument to the Prince Consort in Charlotte Square, 17th August 1876, the artist was knighted at Holyrood Palace. To the embellishment of Edinburgh he has further contributed by the statue of Sir Walter Scott on the Scott monument, the equestrian statue of Wellington, the statues of Lords Melville and Jeffrey, of Professor Wilson (1865) and Dr. Thomas Chalmers (1878). In the hall of Greenwich Hospital is his statue of Lord de Saumarez; in the cathedral at Glasgow his monument to the 93d Highlanders; and in the Cathedral at Dunkeld his monument to the 42d Royal Highlanders. At Calcutta the statues of Dalhousie and Wilson are his; and at New York the colossal statues of Sir Walter Scott (1872) and Robert Burns (1873) in the Central Park.—**Gourlay S.**, brother of the preceding, born at Edinburgh in 1819, received his art-education at the Board of Manufactures under Sir William Allan, and studied privately under Robert Scott Lauder, R.S.A. He first exhibited in 1832. Among his principal works are 'Robert Burns turning up the Mouse's Nest' (1839; engraved); 'The Master of Ravenswood parting with Caleb Balderstone' (1842); 'Scene from *The Monastery*' (1843); 'Llewelyn and his brave Hound Gelert' (1857); 'The Death of Old Mortality' (1859); 'The Highland Raid' (1863); 'A Cottage Bedside at Osborne' (1863; engraved); 'The Pass of Leny—Cattle going to the Tryst'; 'A Challenge' (1876), &c. As a painter of cattle S. is unsurpassed in Britain. The rough shaggy creatures on his canvas seem almost to live under the touch of his graphic and brilliant brush.

Steel Toys is a technical term for small articles, as buttons, buckles, watchguards, &c., made of polished steel. They are mainly produced at Birmingham and London.

Steel'yard. See BALANCE.

Steen, Jan, a Dutch painter, second only to the greatest, was born at Leyden in 1626. His chief instructors were Brouwer and Jan van Goyen. In 1658, at his father's advice, he set up a brewery at Delft, and when this proved a failure he became keeper of a tavern. According to the traditional accounts he led a dissipated and thriftless life, and at his death left his wife and a large family in utter destitution. But whatever were his faults or misfortunes, the number of his paintings is sufficient to prove that he was no idle debauchee. His lines are too correct and his colouring too careful, to be the work of a drunkard. He generally selects domestic and social subjects from everyday life, and even when he represents historical and scriptural scenes he treats them with amusing simplicity. Fairs, weddings, tavern-incidents, and merry-makings are his delight, and he enters into the spirit of his theme with a fine mixture of kindly sympathy and satiric mockery. His humour is as genuine as that of Hogarth, and his satire is less brutal. He frequently introduces himself as a jovial participator or amused spectator. Among his more remarkable pieces are 'The Nine-Pin Players,' 'The Feast of St. Nicholas,' and 'The Representation of Human Life.' Upwards of 300 are described in Smith's *Catalogue Raisonné*, vol. iv. and *Supp.* As S. has always been a favourite in England, our collections, both public and private, are richer in his works than those of his native country. He is well represented at the Hague, in Amsterdam, and at the Hermitage in St. Petersburg. See Van Westrkeenen, *J. S.*, *Étude sur l'Art en Hollande* (The Hague 1856); J. A. Crour's edition of Kugler's *Handbook of Painting* (1874); and Van der Villigen, *Les Artistes de Haarlem*.

Steen'wyck, Hendrik, a Dutch painter, born at Steenwyck in 1550, died 1603. He excelled in the execution of church interiors, ablaze with tapers. His son Hendrik, called 'the Young S.,' was born about 1589, and became the friend of Vandyke, for whom he painted backgrounds. He died in London, in what year is unknown.

Steeple. See SPIRE.

Steeplechase' (Ger. *kirchthurmrennen*, 'a kirk-tower race'), the name given to a rough race across country. The peculiar name would seem to have been given to the race on account of the church steeple being fixed as the goal. Since the end of the 18th c. steeplechases have been run on regular courses marked out with flags. In 1841 the first *handicap* chase was run at Newport-Pagnell, and from that time the S. horses have been regularly weighted according to merit, without respect of sex, age, or size. In spite, almost it would seem because of, its danger, steeplechasing has become exceedingly popular throughout England, and forms an important item in nearly all spring and autumn meetings.

Steer'ing is directing a ship in a given course, and is effected by means of the helm or rudder. Under the latter heading the mechanical action of the helm is explained. The steersman's post is necessarily one of great responsibility, especially during rough weather, or in estuaries or straits where strong currents run. In such circumstances, S. is a practical solution of the composition of velocities.

Steevens, George, an English critic, was born at Stepney, Middlesex, 10th May 1736, educated at Kingston-on-Thames and Eton, and in 1754 became a scholar of King's College, Cambridge. His first publication, *Twenty of the Plays of Shakespeare* (4 vols. Lond. 1766), at once secured him a position among the literary workers of his time, and Johnson gladly accepted his assistance for the edition of Shakespeare which was completed in 1773; but after the appearance of Malone's 'Supplement' in 1780, S. set to work on his own account as a rival commentator, and in 1793 he produced a corrected text of the great dramatist in 15 vols. Though the work was as remarkable for the audacity of its gratuitous alterations as for its exhibition of learning and ability, it met with complete success, and remained the standard edition till the publication of Knight's in 1838. The fortune which he

inherited from his father relieved S. from all necessity to labour, and though he contributed to the *St. James' Chronicle*, the *Critical Review*, Johnson's *Lives of the Poets*, and Dodsley's *Annual Register*, and assisted Reed in his *Biographia Dramatica*, and Nicols in his *Anecdotes of Hogarth*, he made no important venture in his own name. He died at Hampstead, January 22, 1806. His library was sold for £2740, and a catalogue was published as *Bibliotheca Stevensiana*.

Steff'ens, Henrik, was born May 2, 1773, at Stavanger in Norway, entered Copenhagen University in 1790, and devoted himself to botany and mineralogy. After travelling at the expense of the Danish state in Norway (1794), and in Germany (1798), he was successively appointed lecturer at Copenhagen University (1802), professor at Halle (1804), at Breslau (1811), and at Berlin (1832), where he died, 13th February 1845. S. was a foremost disciple of the school of Schelling. His chief works, remarkable for their variety, the abundance and freshness of their ideas, and the richness of their style, are *Grundzüge der Philosophischen Naturwissenschaft* (1806), *Handbuch der Oryktognosie* (3 parts, 1811-19), *Anthropologie* (1822), *Karicaturen des Heiligsten* (2 vols., 1819-21), *Von der falschen Theologie und dem Wahren Glauben* (2d ed. 1831), the novels *Die Familien Walseth und Leith* (3 vols. Bresl. 1827), *Die vier Norweger* (6 vols. Bresl. 1828), and *Malcolm* (2 vols. Bresl. 1831), collected under the title *Novellen* (16 vols. Bresl. 1837-38), and his interesting autobiography, *Was ich Erlebte* (10 vols. Bresl. 1840-45), and *Nachgelassene Schriften*, with a preface by Schelling (Berl. 1846).

Stein, Heinrich Friedrich Karl, Freiherr vom und zum, the eminent Prussian statesman, was born of a noble family at Nassau on the Lahn, October 26, 1757. He studied at the University of Göttingen (1773-77), and in 1778 entered the service of the Prussian state, in which, owing to his rank, fortune, and abilities, he rapidly rose. In 1804 he was summoned to Berlin, and made minister of finance, trade, and commerce, under Friedrich Wilhelm III. In 1807, owing to some court quarrel, he was dismissed, but that same year he was recalled and appointed Prime Minister. This was immediately after the battle of Jena, when Prussia was completely under the power of France, and at the very lowest point of national existence. In the dark years that followed, S. carried through a system of reforms that cut his country free from past trammels, and laid the foundations of future greatness. The land had hitherto been exclusively in the possession of the nobles; now it might be held by peasants, whilst in return the upper classes were permitted to engage in trade without losing caste. All vestige of slavery was abolished. The right of self-government was given to municipalities, and military service was made compulsory on the whole male population. But these reforms, and S.'s general activity, soon attracted the unfavourable notice of the French government, and he was obliged to retire again into private life. In Hardenberg he found a worthy successor, who carried on his work cautiously but firmly while he lived in retirement at Prague. In 1812 he went to Russia, where he strove with all his might to rouse the Czar against Napoleon. He took an active part in the war of liberation that followed in a few years, though he was bitterly disappointed at its result as far as regarded Germany. He said the Vienna Congress ended in a farce. After the settlement of affairs he had no real share in the imperial government. His views were far too liberal to suit the then rulers of Prussia. In the management of the provincial affairs of Westphalia he took a warm interest, and in 1827 he was appointed a member of the Berlin Council of State, though this appointment was given as a mere empty honour which Prussia could not in decency withhold from her greatest living statesman. He occupied himself during the last years of his life in studies relating to the history of Germany. The last in the male line of his ancient family, he died at his castle of Kappenberg in Westphalia, 29th June 1831. S. was a man of iron will, of great practical ability, and of wide and far-seeing views. His darling schemes were German unity and a constitutional and free government; and though he did not live to see their fulfilment, he did much to make possible that which afterwards happened. See Pertz's *Leben des Freiherrn von S.* (6 vols. Berl. 1849-1855); Stern's *S. und seine Zeitalter* (Leip. 1855); and above all Seeley's *Life and Times of S.* (3 vols. Lond. 1878).

Stein'bok. See BOQUETIN.

Stein'thal, Heymann, an eminent German philologist, was born in Anhalt 16th May 1823, studied philology and philosophy at Berlin and Paris, and was appointed professor at Berlin in 1863. He is the author of *Ursprung der Sprache* (1851; 3d ed. 1877), *Entwickelung der Schrift* (1852), *Charakteristik der Hauptsächlichsen Typen des Sprachbaues* (1860), *Geschichte der Sprachwissenschaft beiden Griechen und Römern* (1862), *Abriss der Sprachwissenschaft* (1871), and a number of lesser writings on philological subjects.

Stella'ria. See CHICKWEED and STITCHWORT.

Stel'vio (It. *Giogo di Stelvio*, Ger. *Stilfserjoch*), a mountain pass between Italy and the Tyrol, and the loftiest carriage-road in Europe. It is part of the great road from Milan to Innsbruck, and crosses the Tyrolese Alps from Bormio to Glurns, in Austria, about half a mile S. of the Grisons frontier. The road, which attains a height of 9045 feet, was completed by the Austrian government in 1828 at a cost of £300,000. Over the pass tower the Geisterspitze or Monte Video, 11,362 feet, and the Tuckett-spitze, 11,368 feet, while the magnificent view to the N. includes the snowy dome of the Ortler. The S. is only free from snow in warm seasons; even in July the road is usually lined with drifts some 8 feet deep. In this pass are the Cristallo and S. glaciers.

Stem of a plant is its ascending axis, which grows upwards from the embryo, branches, and bears first one or more leaves in succession, then one or more flowers, and finally one or more fruits. It contains the tissues or other channels by which the nutriment absorbed by the roots, the water supply, and the elaborated sap, are conveyed to the necessary parts of the plant. The anatomical structure of the S. is very different in the two great classes of flowering plants called *Exogens* and *Endogens*, which correspond with few exceptions to the two classes Dicotyledons and Monocotyledons.

Sten'cilling, a ready method of producing a running ornament, fret, or other design on a wall or other surface by means of a stencil, *i.e.*, a piece of pasteboard or plate of metal in which the required pattern is cut. The stencil is laid on the wall, and a brush charged with colour is passed over it. Letters may be printed with ink in the same manner. Sometimes the stencil has the pattern pricked in outline only; in this case a small bag containing powdered chalk is struck against it, and the pattern so outlined on the wall is afterwards painted in.

Sten'dal, a town of Prussia, province of Sachsen, 36 miles N. of Magdeburg and 65½ W. of Berlin by rail. The finest of its six churches are the *Marienkirche* and the cathedral, founded in 1188. It has also a gymnasium, and a monument to Winckelmann. There are tanneries, wool, cotton, tobacco, glove, and cloth manufactories, and brick kilns. The first book printed (the *Sachsenspiegel*) in Altmark was issued here in 1488. Pop. (1875) 12,870.

Sten'ochromy (Gr. *stenos*, 'short,' and *chrōma*, 'a colour;' hence a short way of colouring), a process of Polychrome Printing (q. v.) recently brought to considerable perfection by Mr. Otto Radde of Hamburg, and patented by him in Great Britain. A colour-block representing a picture or design is built up after the manner of a mosaic, with soapy compositions, prepared by thoroughly incorporating pure pigments with fatty substances. The colour-compositions melt with heat, solidify on cooling, and possess the same specific gravity and yielding power. The method of forming the colour-block is as follows:—A shallow wooden frame of the size of the intended picture is taken, and into a portion of it, marked off with strips of brass placed edgewise, a quantity of liquid colour is poured. As soon as the colour has solidified, the required outline is traced on it, the brass strips are removed, and the colour is cut vertically to the tracing by means of a peculiar knife. Another compartment or cell is then formed with the pieces of metal, and a second colour is poured in and cut vertically as required. The same plan is followed with all the other colours; and when the picture is completed, the surface is levelled, and impressions are taken on paper of an absorbent nature with slight pressure in a kind of lithographic press. The stenochrome is finished by an overprint from a stone which marks the outlines. For highly-finished pictures from two to four overprints are necessary to obtain proper blending effects.

Stenog'raphy (Gr. *stenos*, 'narrow,' and *graphō*, 'I write'), a method of writing expeditiously by means of simple arbitrary

signs and abbreviations. The ancient Greeks had some acquaintance with this art, but it was left for Professor Taylor of Oxford to reduce it to rule during last century. Phonetic systems of shorthand writing like Pitman's have brought S. into disfavour, so that it is now seldom practised. See SHORTHAND.

Ste'phen, the name of ten, or, according to others, nine Roman popes. **St. S. I.** succeeded Lucius III. in 253. His pontificate (253-57) was signalised by his zeal against the heresies of Marcien, bishop of Arles, Basilide, bishop of Merida, and Martial, bishop of Leon, and by his controversy with Cyprian, bishop of Carthage, on the re-baptising of heretics. **S. II.** was elected pope, March 27, 752, but having died of apoplexy a few days after his election and before his consecration, he has not been counted in the number of popes by some historians.—**S. III.** (or **II.**) was elected pope, March 29, or 30, 752. Harassed by Ataulf, king of the Lombards, he fled over the Alps to Pippin, who received him with the utmost reverence, and was crowned by him king of the Franks in Rheims Cathedral (754). Pippin, warmly embracing the cause of S., entered Italy, defeated the Lombard king, and deprived him of the Exarchate of Ravenna, which he presented to the pope. From this 'donation of Pippin' dates the temporal power of the papacy. A second defeat of Ataulf added the Pentapolis to the dominions of the pope, who died in 757.—**S. IV.** (or **III.**) was elected pope August 5, 768, and the following year, in opposition to the Eastern Church, sanctioned at the Lateran Council the reverence of saints and images. He died in 772. **S. V.** (or **IV.**) succeeded Leo III. June 22, 816, but died in January 817, immediately on his return to Rome after having crowned Hludwig the Pious.—**S. VI.** (or **V.**), a native of Rome, succeeded Adrian III. in 885. Elected without the confirmation of the Emperor Karl the Fat, the latter wished to depose him, but S. was successful in maintaining his position. He died in 891.—**S. VII.** (or **VI.**), elected May 22, 896, is only remembered for his having caused the corpse of Formosus, his predecessor but one in the papal chair, to be exhumed, stripped of its pontifical robes, and condemned to lay burial. S., however, was strangled by his enemies after a reign of eighteen months, and condemned by his third successor to a similar indignity.—**S. VIII.** (or **VII.**) reigned from 929 to 931, entirely under the control of his mistresses, Theodora and Marozia. **S. IX.** (or **VIII.**), a kinsman of the Emperor Otto, reigned from 939 to 942. **S. X.** (or **IX.**), a brother of Gottfried, Duke of Lothringen, was elected pope in 1057 by the influence of Hildebrand (afterwards Gregory VII.). He vigorously opposed the sale of benefices and the immorality of the clergy, but after reigning eight months, died at Florence in 1058.

Ste'phen, King of England (1135-54), was born in 1105, third son of the Comte de Blois and Adela, sister to Henry I. Comte of Mortain by his uncle's grant, he was also Comte of Boulogne by marriage with the last count's daughter, and she through her mother came of Cerdic's line, and was the niece of David of Scotland. S. had sworn to receive the Empress Matilda as Lady (1127), but upon Henry's death he hastened over to England, and, elected king by a body composed of London citizens and notables of the land, was crowned by the Archbishop, 22d December 1135. Even Robert of Gloucester, the Empress' natural brother, paid him homage; Normandy acknowledged him before the year was out; and Pope Innocent confirmed a title which S. himself based in his Oxford Charter (1136) on the consent of clergy and people. Others, however, were found to challenge it. Geoffrey, the Empress' husband, had already invaded Normandy, and David (q. v.), crossing the Border, was only stayed by the cession of Cumberland. Next came a Welsh revolt and scattered risings; and a second Scottish invasion (1138) ended in the Battle of the Standard, fought at Northallerton (q. v.), the one bright spot in the darkness of S.'s reign. In 1139 Matilda landed in England, took S. prisoner, and, joined by his brother, the legate Henry of Winchester, was elected Lady of England and Normandy by a clerical synod (1141). Her haughtiness soon lost her the hearts of the London citizens; she fled to Oxford, and there was besieged by S., who had been exchanged for the Earl of Gloucester. In snow-white robes she crossed unnoticed the frozen Thames, and after five more years of weary warfare returned to Normandy (1147). The death of her brother and chief champion (1148), and of Eustace, S.'s son (1152), made both the rivals willing to come to terms; and the Treaty of Wallingford (1153) left S. king, with Henry, Matilda's son, his recognised heir. Before a year had passed S. died at Canterbury, 25th October 1154. 'He, mild man, was soft and good, and no justice did not,' says the pithy chronicler, and then describes with marvellous vigour how the land was filled with castles, and the castles were filled with devils, how poor men starved of hunger, and it seemed as if Christ and his hallows slept. Good came from the evil though, their common sufferings welding Norman and Englishman into a common people; whilst from the alternate depositions by the Church of S. and Matilda flowed the deposition of James II., the principle of a compact between the ruler and the ruled. See vol. v. of Freeman's *History of the Norman Conquest* (Oxf. Clar. Press, 1876).

Ste'phen, James, born at Pode, Dorsetshire, in 1759, of an Aberdonian family, was educated at Winchester. After serving as a parliamentary reporter, he received a post in the W. Indian island of St. Christopher's, there gained a thorough mastery of colonial law, and returning home with a large fortune became a celebrated advocate in prize cases before the Privy Council. Entering Parliament for Tralee, and appointed under-secretary for the colonies, he warmly espoused the anti-slavery cause, and for his suggestion of the successful Continental Blockade (1803) was created a master of the Court of Chancery. He died at Bath, 10th October 1832, having published *War in Disguise, or the Frauds of Neutral Flags* (1806), *History of Toussaint l'Ouverture* (1814), and *Slavery of the British W. Indies* (2 vols. 1824-30), which Macaulay described as 'the most comprehensive and in many respects most valuable' work upon the subject. —His son, **Henry John S.** (1787-1864), serjeant-at-law, was author of a *Treatise on Pleading in Civil Actions* (1824); *Summary of the Criminal Law* (1834), *New Commentaries on the Laws of England* (1841; 7th ed. by his son James S., 1874, &c.). —The third son, **Sir James S.**, born at Lambeth, 3d January 1789, having graduated LL.B. from Trinity Hall, Cambridge (1812), was called to the bar at Lincoln's Inn (1813). Appointed counsel to the Colonial Office and Board of Trade, he held these posts till 1834, when he became under-secretary of state for the colonies in Melbourne's Ministry. Ill-health obliged him to retire from office (1847), when he was knighted; but two years later he accepted a call to the chair of modern history at Cambridge, which he occupied down to his death at Coblenz, 15th September 1859. His brilliant *Essays in Ecclesiastical Biography* (1849; 4th ed. with Memoir by his son, 1860) were all but one contributed to the *Edinburgh Review*, and he was also author of *Lectures on the History of France* (1851).—**Sir James Fitzjames S.**, eldest son of the preceding, was born in London, March 1829, and educated at Eton, King's College, London, and Trinity College, Cambridge, graduating B.A. (1852). Called to the bar of the Inner Temple (1854), he travelled the Midland Circuit; and becoming Queen's Counsel (1868), was recorder of Newark-on-Trent (1859-69), and legal member of the Council of the Viceroy of India (1869-72), as such being author of the Indian Evidence Act. He was knighted, and in 1875 became Professor of Common Law at the Inns of Court. In 1873 he unsuccessfully contested Dundee as a moderate Liberal. Among his works are *Essays by a Barrister* (1862), reprinted from the *Saturday Review*; a *General View of the Criminal Law of England* (1863); *Liberty, Equality, and Fraternity* (1873); and *Digest of the Law of Evidence* (1876). In November 1878, when the policy of the English Government in reference to the Ameer of Afghanistan was vehemently assailed, S. was one of its most unflinching champions.—His younger brother is **Leslie S.** (born 1832), late fellow of Trinity Hall, and president of the Alpine Club, the present (1878) editor of the *Cornhill Magazine*. Besides the charming critical essays, *Hours in a Library* (2 vols. 1874-76), he has published *The Playground of Europe* (1871), *History of English Thought in the 18th C.* (2 vols. 1876), and *Samuel Johnson* (1878), in the series *English Men of Letters*. —**Sir George S.**, the first James S.'s youngest son, was born at St. Christopher's in 1794, and, formerly a solicitor, was called to the bar in 1849, travelling the Northern Circuit. Like his father, an earnest abolitionist, he was also active in the reform of parochial relief, the police force, and imprisonment for debt, earning thereby the honour of knighthood (1837). In 1855 he emigrated to Victoria, where he has since resided. Of several works by him, the chief are *The Niger Trade and African*

Blockade (1849), *Principles of Commercial Law* (1853), and *Anti-Slavery Recollections* (1858).

Ste'phen, St., King of Hungary (997-1038), was canonised after his death in recognition of his services as the introducer of Christianity into Hungary. An Order named after him exists in Hungary, and he is the patron of numerous churches. See HUNGARY.

Ste'phens (Lat. *Stephanus*, Fr. *Estienne*), the name of a celebrated French family of printers. (1) **Henri** (born about 1460 or 1470) was descended from the lords of Lambèsc in Provence.. He began to print along with Hopil Wolfgang at Paris in 1502, and before his death he had brought out more than 120 works in folio. The first was the *Ethica* of Aristotle, and most of the others were scientific or philosophical. His motto was either *Plus olei quam vini*, or *Fortuna opes auferre non animum potest*, the latter perhaps referring to the fact that he had been disinherited by his father as disgracing the family by his mechanical craft. He died in 1520. His three sons followed in his footsteps.—(2) **François** (born 1502, died 1550) continued in partnership with Simon de Colines, who married his father's widow and carried on the business.—(3) **Robert**, born in 1503, was one of the most learned men of his time. While still with Colines, and not more than nineteen years of age, he printed a copy of the New Testament, remarkable for its accuracy, and after his marriage in 1527 with Petronella, daughter of Judocus Badius Ascensius, his house became a regular rendezvous of the literati of Paris. The particular attention which he devoted to the Scriptures aroused the hostility of the Sorbonne, and in spite of the protection of François I., who made him printer to the king in 1539, he was more than once formally prosecuted for printing heretical matter. At length under Henri II. his position became so dangerous that he sought refuge at Geneva, where he passed over to the Protestant Church. He died in 1559. By his will, still preserved at Geneva, he disinherited his sons Robert and Charles because they returned to the Roman Catholic communion. Among the finest specimens of his printing are his Hebrew Bibles, the Greek New Testament of 1550, and the edition of the Old Testament in 1540, with the Vulgate and a new translation side by side. His greatest original work was his *Thesaurus Linguæ Latinæ*, which, since its first appearance in 1531, has been reprinted at Venice (1551), Lyon (1575), London (1734), Basel (1740), and Leipzig (1749).—(4) **Charles** (born 1504, died 1564) was named printer to the king in 1552, and proved a worthy successor to his brother, but he fell into debt, and his last days were spent in the Chatelet prison.—(5) **Henri**, son of Robert, born at Paris in 1528, is the greatest scholar of the family. Educated by Pierre Danes, Jacobus Tusanus, and Adrianus Turnèbus, he attained great proficiency in the classical languages at a very early date, and when only twenty he published an edition of Horace. His father sent him to Italy to visit the libraries and learn the art of engraving; and on his return he brought with him many valuable manuscripts of ancient authors. In 1550 he visited England, and was well received by Edward VI.; in 1554 he was at Paris and printed the first edition of Anacreon; in 1556 he again visited Italy, and in 1557 he finally settled at Geneva. For ten years he received the powerful assistance of Ulrich Fugger of Augsburg, who furnished him both with money and MSS., but on Fugger's death his resources were hardly sufficient for the production of his great *Thesaurus Linguæ Græcæ* (4 vols. 1572; new ed. by Didot, 9 vols. 1829-63). To add to his difficulties, the Consistory at Geneva proved as prone to persecution as the Sorbonne at Paris. He was admonished, debarred from the sacrament, excommunicated, imprisoned, expelled from the Council of the Two Hundred, and forbidden to print anything which had not been submitted to the censors. For some months in 1592 he occupied the chair of Greek at Lausanne; we next find him at Heidelberg and Montpellier; and in March 1598 he died in the public hospital at Lyon, broken-hearted with the news that his MSS. and books had perished in an earthquake. He had published in all about 170 editions of classical authors; and besides his *Thesaurus* he had written *La Conformité du Langage François avec le Grec*, and other works in praise of French, which he regarded as the finest modern language, *La Vie de Catherine de Médecis*, and *Rex et Tyrannus*, a poem in refutation of Machiavel.—(6) **Antoine**, born in 1592, closes the line. He was appointed printer to the king at Paris in 1615, and syndic of the printers' guild in 1649. His last publication dates 1664, and he died in poverty and blindness in the public hospital at Paris in 1674.

No one has done more for the history of the S. family than Ambroise Firmin Didot, the publisher. The results of his investigations may be found in *Nouvelle Biographie Générale*, vol. xv., and *Essai sur la Typographie*, 1855, reprinted from *Encyclopédie Moderne*. See also Maittaire, *Stephanorum Historia* (Lond. 1709); Passow, *Heinrich Stephanus*, in Raumer's *Hist. Taschenbuch* (1831); Crapelet, *Rob. Estienne et le Roi François I.* (Par. 1839); Greswell, *View of the Early Parisian Greek Press* (Oxf. 1833); Renouard, *Annales de l'Imprimerie des Estiennes* (2d ed. 1843); Dupont, *Hist. de l'Imprimerie* (Par. 1854); Bernard, *Les Estienne et les Types Grecs de François I.* (Par. 1856); Feugère, *Caractères Littéraires du XVIe. Siècle* (Par. 1864); *Quarterly Review* (Lond. 1865); Werdet, *Hist. du Livre en France* (Par. 1864); and Albert de Montet, *Dict. Biographique des Genevois* (Laus. 1877).

Ste'phens, Alexander Hamilton, an American politician, was born at Crawfordville, Georgia, February 11, 1812. He was educated at the University of Georgia, and was called to the bar in 1834. After sitting for some years in the Georgia House of Representatives, he was elected a member of the United States House of Representatives, where he sat from 1843 until 1859, being a prominent member of the Democratic party. In the disputes which preceded the Civil War, while opposing the *policy* of secession, he maintained the *right* of a State to secede from the Union. On the outbreak of the struggle he became a member of the Confederate congress, and Vice-President in the Provisional Government, being afterwards confirmed in that post under the so-called 'permanent constitution.' At the end of the war he was confined for five months as a state prisoner in Fort Warren, but was released on parole in October 1865. He has since been twice elected to Congress, where he maintains his position as a staunch Democrat.

Ste'phenson, George, born at Newcastle-on-Tyne, June 9, 1781, was the son of an engine-tenter at a colliery. In 1804 he became a breaksman at Killingworth colliery, where his mechanical genius secured him a growing reputation as a repairer of engines, and led to his promotion to the post of engine-driver, at a wage of 12s. per week. The improvements of Watt were now bearing fruit, and steam was rapidly coming into favour as a motive power. A locomotive had already (in 1811) been constructed for the Wigtown Railway before S. turned his attention to this application of steam. His first locomotive, run on the Killingworth Railway, July 25, 1814, was sufficiently successful to encourage him in his work, and in 1822 five of his locomotives, constructed upon improved principles, were at work on the Hilton Colliery Railway, of which he had become engineer. In 1823, with the aid of Edward Pease, he started the famous locomotive manufactory at Newcastle, which supplied the Stockton and Darlington Railway, opened for traffic in 1825, with locomotives capable of travelling at the rate of 8 miles per hour. In 1826, S. surveyed and subsequently constructed the Liverpool and Manchester Railway, on which, October 1, 1829, the famous competition of locomotives took place, which established at once the fame of S. and the adoption of the steam-engine as a locomotive power. His engine, the *Rocket*, attained a maximum speed of 29 miles per hour. This increased speed was greatly due to the use of the blast-pipe, invented by Hackworth, whose engine, the *Sanspareil*, broke down during the competition. The great merit of Stephenson's improvements lay in the simplification of the machinery, thus diminishing the liability of the engine to get out of order. His subsequent career was one of unbroken prosperity. As contractor, engineer, and manufacturer, he took the lead at once; and the network of railways which now cover our island is a fitting tribute to his genius. His claims as an independent inventor of the safety-lamp are now unquestioned, though Davy had the priority. He died August 12, 1848, at Tapton House, near Chesterfield, Derbyshire. His character was as admirable as his genius; rugged strength, boyish enthusiasm, and sterling honesty were its most conspicuous qualities.—**Robert S.**, son of the preceding, was born at Willington Quay, near Newcastle-upon-Tyne, 16th October 1803. His father spared no pains to give him as good an education as was possible, sending him for a session to the University of Edinburgh. In 1822 he was apprenticed to his

father; but soon after he went out to S. America to report upon the gold and silver of Columbia and Venezuela. On his return to England in 1827 he entered heartily into his father's schemes, suggesting many of the improvements which were embodied in the *Rocket*. The *Planet* engine was a subsequent development, and forms the type upon which our modern locomotives are constructed. S. was also engaged to survey the London and Birmingham Railway, and was designer or consulting engineer of many of the national railways of Germany, Norway, Denmark, Egypt, India, &c. As an engineer of bridges he is world-famed, his greatest undertakings being the high-level bridge at Newcastle, the Victoria Bridge at Berwick, and the bridge over the Nile at Kaffre Azzayat, the tubular railway bridges at Conway and over the Menai Straits, and the Victoria Bridge over the St. Lawrence. The last is undoubtedly his masterpiece. In 1847 he became M.P. for Whitby, and in 1855 was decorated by the Emperor of the French with the Grand Cross of the Legion of Honour, was made a D.C.L. of Oxford, and was elected President of the Institute of Civil Engineers. He died October 12, 1859, of an illness contracted in Norway, and was buried in Westminster Abbey. He inherited the fine character as well as the great abilities of his father, whose memory he cherished with more than filial devotion. See Smiles' *Lives of Engineers* (1862).

Steppes (Slav.), the distinctive name given to the immense barren plains of Central Asia and S.E. Europe. Mackenzie Wallace, who visited the territory of the Inner Horde, near the Caspian, describes the steppe as 'a country level as a sea, with not a hillock or even a gentle undulation to break the straight line of the horizon, and not a patch of cultivation, a tree, a bush, or even a stone, to diversify the monotonous expanse' (*Russia*, 1877.) The S. correspond to the Prairies (q. v.) of N. America, and to the S. American Llanos (q. v.) and Pampas (q. v.). In spring they are veiled with a thin covering of bright verdure, which is scorched and russet by June; in winter they lie under a thick pall of snow, which is swept hither and thither during stormy weather in dense, fine-particled clouds. The mirage is a common phenomenon of the steppe.

Sterculia'ceæ, a large order of herbs, shrubs, or trees allied to Malvaceæ (q. v.), possessing also the mucilaginous, fibre-yielding qualifications of that order. It is chiefly tropical, dispersed over the Old and New World, with some extra-tropical genera in S. Africa and Australia, and a few species without the tropics in the N. hemisphere. The flowers, young shoots, &c., of the type genus *Sterculia* have frequently an unpleasant smell, hence the name. Of plants belonging to S., the most noteworthy are *S. urens*, the seeds of which are eaten in India, and a gum is obtained from incisions made in the bark; *S. villosa*, the inner bark of which yields a very strong coarse fibre for ropes and bags; *S. carthaginensis* of tropical America, with seeds forming an article of diet in Brazil, &c., under the names Chaca and Panama; *S. rupestris*, called 'bottle-tree' in Australia from its bellied trunk. Various species of *Thomasia* and *Lasiopetalum* from Australia are grown as ornamental greenhouse shrubs. See BYTTNERIACEÆ, COCOA, COLA NUT, DURIAN, and TRAGACANTH.

Stére (Gr. *stereos*, 'solid') the French unit of solid measure, equal to one cubic metre, or 1·30802 cubic yards.

Ste'reochromy (Gr. *stereos*, 'solid,' and *chrōma*, 'colour'), a process of mural painting in which water-glass is employed to fix or consolidate the colours. It has not hitherto proved successful, and is for the time abandoned.

Ste'reoscope (Gr. *stereos*, 'solid,' *scopeō*, 'I see,' or 'I look at'), a simple and popular optical contrivance, by which two flat slightly dissimilar pictures of an object are fused into one image, having the actual appearance of relief. The S. is constructed in accordance with the visual phenomena which convey to the mind impressions of the relative forms and position of an object. When a near object having three dimensions is looked at, a different perspective representation of it is seen by each eye; in other words, there is distinct binocular parallax. Certain parts are seen by the right eye, the left being closed, that are invisible to the left eye, the right being closed, and *vice-versa*, and the relative positions of the portions visible to each eye in succession differ. These two visual impressions are simultaneously perceived by both eyes, and are combined into one image, producing the impression of perspective and relief. If, then, truthful right-and-left monocular pictures of any object be so presented to the two eyes that the optic axes, when directed to them, shall converge at the same angle as when directed to the object itself, a solid image will be seen. This is effected with the S., a reflecting form of which was invented by Professor Wheatstone in 1838. It is constructed so that the two dissimilar pictures are reflected to the eyes from two small plane mirrors placed at right angles, the faces being towards the observer. Subsequently Sir David Brewster invented the refracting or lenticular S., based on the refractive properties of semi-double convex lenses; and this instrument, of which there are numerous forms, is now in general use. Convex lenses magnify the pictures besides producing a stereoscopic effect. Photography greatly assists the S. in providing perfectly accurate right-and-left monocular views, which are taken simultaneously on a plate in a twin-camera. Sometimes, in the case of objects which from their distance have no sensible binocular parallax, photographs are taken from two points considerably apart; and when such views are combined in the S., the effect of relief is greatly exaggerated. Several modifications of the reflecting S. are distinguished by the names *pseudoscope*, *iconoscope*, *telestereoscope*, and *polistereoscope*, the last being an apparatus which serves the purposes of all the others.

Ste'reotyping and Elec'trotyping. S. is the process by which fac-simile plates of metal are substituted for movable type in the art of printing. These plates are composed of lead and tin, with a small proportion of antimony, to give the metal a sufficient degree of hardness to bear the impression of the printing press or machine, and they are more used now in consequence of the cheapness of books generally causing large numbers to be printed, thus saving the wear and tear of the type. S. was invented by Mr. William Ged, a goldsmith of Edinburgh, about 1725, and after trying to introduce it in that city for a time, he removed to London, where he entered into partnership with a bookseller named Fenner. These two afterwards associated with themselves several others, amongst whom was Ged's own son James, and they were first employed by Mr. Basket, the king's printer, and afterwards by the University of Cambridge to stereotype Bibles and Prayer-Books. The pressmen, however, who were engaged in the work of printing from these plates, acting in conjunction with the compositors, the latter dreading the new invention would be detrimental to their interests, did not scruple to damage the plates, and in consequence of this opposition, combined with disagreement among the partners, Ged shortly after returned to Edinburgh. Here he again proceeded with his invention, among his first works being an edition of Sallust, a plate of which can still be seen in the Advocates' Library, as well as a copy of the work. Ged did not seemingly profit by his invention, as he died in straitened circumstances in October 1749. Nothing more was heard of the process till it was re-invented by Dr. Tilloch, also of Edinburgh, in 1780, who imparted his secret to Mr. Wilson, a printer in London, and the latter in turn communicated it to Earl Stanhope, by whose aid S. was brought to perfection after many experiments. The original process is altogether simple, but effective. After the form of type has been finally 'read' by the corrector for the press, it is laid on a smooth table, when a square moulding frame with bevelled edges is placed over the forme, into which liquid stucco is poured over the face of the type to a depth of nearly an inch, the types having previously been lightly brushed over with pure sweet-oil to prevent the stucco adhering. As soon as the stucco is set sufficiently, the mould is gently lifted from the type and placed in an oven, where it is subjected to a gradual baking. Transferred from this to the casting-pan, which may contain about a dozen moulds set into grooves, and separated one from the other by thin iron plates, the pan is gradually dipped into a caldron of molten lead, which flows gently into it through small openings left at the corners. Removed after sufficient time has been allowed to fill the pan, it is allowed to cool gradually, and is then broken up and the plates taken out. The plates are then dressed for printing, bad letters looked for and replaced by good ones being soldered in, and the plates reduced to a uniform thickness of about one-sixth of an inch. They are next mounted on wooden blocks, having side and top catches or grips of brass to hold them firmly in their places; and the plate and block both combined being only the same height as movable type, they can be printed on a press or machine in the usual way. This

stucco casting has for some years been greatly supplanted by what is known as the papier-maché process, modified in some particulars by different casters, but generally as follows: The form being ready for casting is covered by a prepared matrix of several sheets of paper—two of tissue, one of blotting, and one of brown, each sheet being brushed over by a mixture of glue, paste, and whiting. This matrix is beaten into the type by a long-handled flat brush, and the hollows on the outside smoothed over by stucco, and then backed up by a sheet of strong wrapper paper. The matrix is next subjected to a heavy pressure over a steam-chest and thoroughly dried, when it is placed within a shallow casting-box slung upon swivels, and secured on three sides by an iron gauge the thickness of the plate. The box is closed firmly by a screw, leaving only a narrow opening at the top into which the metal is poured when the box is brought up to a vertical position. In a very short time the metal sets, the box is thrown back, the screw unloosed, and the plate taken out. If the matrix is carefully removed from the plate, it may again be placed within the box and a second cast taken if required, or laid aside in reserve in the event of accident to the first casting. In many cases where it is doubtful whether a second edition of a book may be wanted, moulds are taken and retained to meet the contingency. By the papier-maché mode plates can be prepared for printing in a very short time, the stucco process being the work of several hours. The introduction of self-feeding rotary machines (see PRINTING) into the newspaper press necessitated a change in their arrangements, as these machines print only from impression cylinders, and this could only be done by stereotype plates, and with them both matrix and plate form the segment of a circle, to enable the plate to fit on to the impression cylinder.

Electrotyping is a similar process for producing plates from types, &c., for printing, chiefly of the finer class of illustrated books and works containing tables of figures, logarithms, &c. The types in the form are first of all brushed over with a very fine kind of blacklead or plumbago, when a shallow tray filled with melted bees'-wax mixed with turpentine and spermaceti is placed over the form, which is then placed under a hydraulic press and subjected to a heavy pressure while the wax is still soft. The wax-mould is next inlaid all round the pages with fine brass wire to conduct the copper, and then suspended by copper wire to the negative pole of a Smee battery, a plate of copper being hung upon the other pole, the whole being suspended in a bath containing a solution of sulphate of copper. The action of the battery deposits a thin layer of copper over the blackleaded type-face of the wax mould, which after several hours' immersion is taken out of the bath, and the thin shell of copper removed from it. The reverse side of the shell from the printing face is next slightly coated with solder, then floated over with metal in such a way that none can reach the type-face, after which the plate is dressed and prepared for printing in the same way as ordinary stereotype plates.

Ster'let. See STURGEON.

Ster'ling, a name used with reference to British money, both of account and currency. The word is a corruption of *Esterlings* or *Easterling*, a name given at first in England to the German traders, and from the time of Richard I. applied to their coins which were of exceptional purity. Hence the use of the word as a synonym for genuine.

Stern'berg, a town of Austria, in Moravia, on the Oskav, a left tributary of the March, 10 miles N.N.E. of Olmütz by rail. Linen and cotton stuffs are extensively manufactured, and are known as S. wares. In the vicinity cherries are cultivated, and there are numerous slate quarries. Pop. (1869) 13,509.

Sterne, Laurence, son of an army lieutenant, was born in the barracks at Clonmel in Ireland, November 24, 1713, passed in 1733 from the free school of Halifax, Yorkshire, to Jesus College, Cambridge, and in 1736 and 1740 took the degrees of B.A. and M.A. The influence of his cousin, the Rev. Jacques S., prebendary of York, procured him the living of Sutton in 1740, and on his marriage with Miss Elizabeth Lumley he obtained the additional and neighbouring living of Stillington. For the next twenty years and more he 'remained an obscure country parson,' finding his amusement in books, painting, fiddling, and shooting, and preaching eccentric and forcible sermons to his wondering parishioners. Two sermons published in 1747 and 1750 attracted little attention; but when in 1759 the two first volumes of *Tristram Shandy* appeared, 'nothing else was talked of, nothing else admired,' and the author on a visit to London found himself the most famous man of the day. He at once took advantage of his success to publish two volumes of sermons in 1770; the following year saw vols. iii. and iv. of *Tristram;* and other two volumes appeared in 1762. Though in 1760 he had been presented with the new living of Coxwold by Lord Falconbridge, he remained but little in the country; the excitement of London life (and such London life!) told heavily on a naturally feeble frame, and he was obliged to go to France for his health. His fame had preceded him, and Paris was only a copy of London. It was not till 1765 that he was able to bring out the 7th and 8th volumes of *Tristram*, and he was again on the Continent for some time before the appearance of the 9th and last in 1767. His travels furnished material for a second great work. The first part of the *Sentimental Journey* was published in two volumes in 1778, but he did not live to write the sequel. An illness caught while looking after the publication of the *Journey* proved too much for his weakened frame, and he died in a lodging-house in Bond Street, 18th March 1778. 'Now it is come!' were the last words he uttered. His body, buried in a graveyard near Tyburn, was unlawfully removed to Cambridge for dissection. The fate of his wife and daughter was long unknown, but it has been ascertained (see *Athenæum*, No. 2225, 1870) that Mrs. Sterne died in 1773 at Albi on the Tarn, and that her daughter married a French tax-collector called Alexandre Medalle in 1772, and died before 1783.

There is hardly an English writer whose moral character has been more severely canvassed than that of S.; and the damnatory epigrams of Walpole, Warburton, Johnson, and Gray are too well known to require repetition. No man of moral sanity would think of setting S. up as a model of conduct; about conjugal fidelity, at least, he seems to have taken but little thought. At the same time his character assumes a less degraded aspect when it is cleared of the mud thrown upon it by malice and ignorance, and receives as its proper background the grossness and depravity of contemporary life. About his position in our literature there is no question. Were Dr. Ferriar's accusations of plagiarism (*Illustrations of S.*, 1798) all well founded, it would make as little difference to the essential originality of S. as it would to that of Michael Angelo could it be proved that he had purloined some of the bricks for St. Peter's at Rome. It has yet to be shown that the humour and pathos of Uncle Toby, Dr. Slop, Mr. Shandy, and Corporal Trim are the product of any theft less sublime than that of a Prometheus.

In 1775 S.'s daughter published his *Letters to his Friends*, along with a brief autobiography (3 vols.); *Letters from Yorick to Eliza* appeared in the same year; and *Letters supposed to have been Written by Yorick and Eliza*, 2 vols., in 1799. W. Durrant Cooper printed for private circulation *Seven Letters by S. and his Friends* (1844). In his *English Humorists* (1851) Thackeray made use of unpublished materials, and more particularly of a *Journal* kept by S. after Mrs. Draper's departure to India, which was in the possession of a gentleman of Bath (see *Athenæum*, 16th March 1878). A work purporting to have been written by S., but now recognised as spurious by all English critics, was edited by Alfred Hédouin as *S. inédit: le Koran* (Par. 1853). Percy Fitzgerald's *Life of Laurence S.* (2 vols. Lond. 1864) is the most elaborate which has appeared, and on the whole it is strongly apologetic and exculpatory. Paul Stapfer's *Laurence S.; sa Personne et ses Ouvrages* (Par. 1870), supplies little that is new, except a fragment of very dubious authenticity, which he regards as a genuine production of his author. The complete edition of S.'s works, by James P. Browne, M.D. (4 vols. Lond. 1873), contains thirteen letters not previously published; and in the *Academy* (1874) may be found an extract from a diary in the British Museum which reports the talk of S.'s servant Richard Greenwood about his master, and a letter of S.'s also in the British Museum, dated November 3, 1750, and containing a notice of his quarrel with his uncle. See, besides, Sir Walter Scott's *Lives of the Novelists; Quarterly Review*, vol. xciv.; and M. Montegut in the *Revue des Deux Mondes* (1865).

Stern'hold, Thomas, an English courtier of the 16th c., who originated what was for a long time in England the standard metrical version of the Psalms. He is usually said to have been a native

of Hampshire, but even on this point authorities are at variance. The only important fact in his life is that he served under Henry VIII. as groom of the chamber with sufficient acceptance to be remembered in the royal will by a bequest of 100 marks, and was continued in the same office under Edward VI. Incited by the success of Clement Marot in France, he published in 1548 *Certaine Psalmes of David* (19 in all), and hoped to 'travaile further in that booke.' But his death followed almost immediately; and when in 1549 there appeared *All such Psalmes of David as T. S. had in his lifetime drawen into English*, the whole number from his pen was only 37. Among the other translators whose versions were added to swell the volume was John Hopkins, and thus it came to pass that S. and Hopkins became in English literature the Castor and Pollox of religious doggerel. In spite of its æsthetic defects, the book was popular, editions appearing in 1550, 1551, 1553, 1560, &c. It was not till 1561 that tunes were printed along with the words, though S. had been accustomed to sing his Psalms to Edward VI. As an appendix to the *Book of Common Prayer*, the completed collection kept its ground till Tate and Brady's version was substituted in the year 1717.

Stern'um, or Breast'bone, the bone in Vertebrates occurring in the chest, and to which certain of the ribs are attached in front. In man it consists of three parts; the upper, called the *manubrium*; the middle, called the *gladiolus*; and the lower, named the *ziphoid*, or *ensiform cartilage*. Posteriorly the S. is concave. Its average length is 6 inches. The first seven *ribs* are attached to the S. directly by their *costal cartilages*. The S. in man is developed from six centres of ossification. In fishes, serpents, tortoises, and turtles there is no S. In bats, armadilloes, and moles it bears a prominent median keel for the attachment of the pectoral or breast muscles. Flying birds have also a large keel.

Stesich'orus, one of the nine great lyric poets of antiquity, is said to have been born in 632 B.C., either at Himera in Sicily, or Metaurus in Magna Græcia, and to have died about 556, but nothing certain is known concerning him. His own name, Tisias, he changed to S. ('leader of choirs') as the inventor of strophe, anti-strophe, and epode, and with his predecessor Alcman he stands at the head of Dorian choral poets. His fragments include erotic, pastoral, and mythological pieces, fables and elegies, hymns, pæans, and epithalamia, and are collected in Bergk's *Poetæ Lyrici Græci* (3d ed. Leip. 1867).

Steth'oscope, The (Gr. *stethos*, 'the chest,' and *skopeō*, 'I look into'), is an instrument invented by Lænnec for examining the sounds of the chest and other cavities of the body. The S. is a simple, hollow cylinder, usually of some fine-grained light wood, as cedar or maple, or of vulcanite or metal, the one extremity being funnel-shaped for application to the part to be examined, and the other large and flat to secure perfect apposition and occlusion for application to the ear. The main object of the S. is to circumscribe and localise the sounds which it transmits; so that the chest end should be small, in order to determine the exact seat of the greatest intensity of sound. The S. is made of a variety of shapes, and it may be either single or double, straight or curved. See RESPIRATION.

Stettin', one of the chief seaports of Prussia, and capital of the province of Pommern, lies on the left bank of the Oder, 14 miles from its embouchure in the Stettiner Haff, and 83¼ miles N.E. of Berlin by rail. The town, which previous to 1874 was a fortress of the first class, consists of the hilly and uneven Altstadt, the modern Neustadt, built since 1848, and the suburbs of Lastadie and Silberwiese on the right bank of the river, but connected with the former by one railway and three passenger bridges. The principal buildings are the Schloss, erected in 1575, formerly the seat of the Dukes of Pommern, now occupied as government buildings; St. Peter and Paulskirche, the oldest church in Pommern, founded 1124, restored 1816; the conspicuous Jacobikirche, dating from the 13th c.; and the Rathhaus, with a collection of Russian medals dating from Catherine II. (1729) and Maria Feodorowna, both natives of S. In the Königs-Platz are marble statues of Friedrich the Great and Friedrich Wilhelm III. S. is the most important manufacturing town in Pommern, and has numerous distilleries, sugar, tobacco, leather, silk, and sail factories, anchor forges, and manufactories of machinery and railway material. The harbour, which has a depth of 13 to 17 feet, was greatly improved during 1877. A new quay 2100 feet long was erected, furnished with six large steam-cranes. Larger vessels discharge at Swinemünde (q. v.) which is the port to S. In 1877 there entered the harbour of S. 11,628 vessels of 1,103,181 tons (2861 of 598,066 tons sea-going vessels), and cleared 11,880 of 1,129,310 tons (2933 of 612,346 tons sea-going vessels). Of those entered, 518 of 190,629 tons were British, and of those cleared, 520 of 190,850 tons, being 7·81 per cent. more than in 1876 and 12·82 per cent. more than the average of the preceding ten years. In 1877 the chief imports were coal 87,895 tons, pig iron 55,341 tons, wine 708,948 gallons, other liquids 170,670 gallons, corn 876,416 quarters, herrings 371,345 barrels, and 1,563,000 bricks; and exports, seeds 4365 tons, oils 7141 tuns, flour 14,168 tons, potatoes 41,225 tons (112·66 per cent. above 1876, and 439·17 per cent. above the average of the preceding twenty years), spirits 177,997 gallons, other liquids 75,598 gallons, corn 350,815 quarters, timber 42,621 lasts, and 530,600 bricks. The import of Scotch herrings for 1878 up to 7th December amounted to 145,362 barrels. The estimated total value of the imports was in 1877, £6,441,219 (£2,450,421 from Britain), of the exports £3,833,741 (£1,432,384 to Britain). The total value of imports and exports was 4·17 per cent. less than in 1876, but British exports and imports showed an increase of 5·52 per cent. Pop. (1875) 113,278.

Steu'ben, Friedrich Wilhelm August Heinrich Ferdinand, Baron von, a general in the American War of Independence, was born at Magdeburg on 15th November 1730. Brought up from childhood in camps and garrisons, he took part as a volunteer in the siege of Prag (1744) at the age of fourteen. His education was completed in the Jesuit Colleges of Neisse and Breslau, and in 1747 he entered the Prussian army as a cadet. At the battles of Prag and Rossbach he distinguished himself, and was an especial favourite of Friedrich the Great, who, on his retirement from the army, at the peace of 1763, assigned him a pension of 400 thalers. In 1764 he became Grand Marshal to the Prince of Hohenzollern-Sigmaringen, a post which he held for ten years. S. then travelled in different parts of France, and being at Paris in 1777 on his way to England he was persuaded by the Comte de St. Germain to offer his services to the American insurgents. He landed at Portsmouth, New Hampshire, on the 1st of December 1777, joined Washington at Valley Forge, and was appointed inspector-general in March 1778. He took part in the battle of Monmouth, sat in the court-martial which tried Major André, and distinguished himself at the siege of Yorktown. His principal service, however, lay in the thorough drill and discipline which he introduced into the colonial armies. He sacrificed a great part of his own property for the maintenance of the soldiers and officers under him, and after the war was tardily rewarded with a pension of $2500 and several grants of land, many of which he gave away to poor soldiers. Ultimately he settled on a tract of land in Oneida county, New York, and died November 28, 1794. See Sparks' *American Biography*, and a Life by Friedrich Kapp (New York, 1860).

Steu'benville, a town of Ohio, U.S., in a district with rich deposits of bituminous coal, 70 miles from Pittsburg by rail, has 17 churches, 4 newspapers, a large nail-factory, blast furnaces, foundries, machine-shops, boiler-works, an oil-refinery, &c. Pop. (1870) 8107.

Ste'vens, Thaddeus, an American politician, was born at Peacham, Vermont, April 4, 1793, graduated at Dartmouth College in 1814, was admitted to the Pennsylvanian bar in 1816, and soon acquired a large practice. In the presidential campaign of 1828 he opposed Jackson, was repeatedly a member of the State Legislature from 1833, was chosen in 1836 a member of the Convention to revise the State constitution, became a canal commissioner in 1838, and took an active part in procuring for Pennsylvania a public-school system. In 1842 he was elected to Congress, of which he remained a member uninterruptedly till his death at Washington, 11th August 1868. S. was a keen anti-slavery politician, a bitter enemy of the South; and by the force of his convictions, no less than his business talents, rose to be one of the leaders of the Republican party. He played a foremost part in the famous impeachment of President Johnson.

Ste'venson, Robert, an eminent Scottish engineer, was born at Glasgow 8th June 1772, and died 13th July 1850. His father, a West India merchant, having died while Robert was a child, he was educated at one of the Edinburgh 'hospitals.' When he was about fifteen years old his mother married Mr. Thomas Smith, who in 1787 was appointed engineer to the new Board of Northern Lighthouses, and thus the young man's future career was practically determined. Entrusted when only nineteen with the supervision of the lighthouse-works on Little Cumbrae in the Clyde, he soon entered into partnership with Mr. Smith, and in 1789 he was chosen as his successor. The skill and daring which he displayed in the erection of the Bell Rock Lighthouse raised him high in public estimation, and his advice was eagerly sought on almost every engineering work of any importance in Scotland. He was the author of the scheme by which the Calton Hill in Edinburgh was laid out and the neighbouring roads articulated; he built the Waterloo Bridge, the Hutcheson Bridge in Glasgow, and the new bridge at Stirling, and he drew up the plans for the harbour at Granton. Among the improvements for which we are indebted to his inventive genius are the application of the catoptric principle to lighthouse illumination; the *intermittent* and *flashing* exhibition of the light; the mast-lamp for lightships; the movable-beam crane and the balance crane; and that form of suspension-bridge in which the roadway is above and not below the chains. At the Carr Rock beacon he utilised the tide as a motive power; and he discovered the *Limuria terebrans.* His writings consist of reports on professional subjects, papers in scientific journals, and articles in the *Encyclopædia Britannica.* See his *Life* by his son, David Stevenson (Edinb. 1878).

Ste'venston, a mining village and parish of Scotland, county of Ayr, about a mile from Saltcoats, on a branch of the South-Western Railway. The parish church, a handsome modern structure, occupies a conspicuous position. The Free Church is a neat little building, and a large and commodious school was erected by the School Board at a cost of over £6000, under the Education Act of 1872. The chief source of the prosperity of S. is the extensive ironworks of Ardeer, erected here in 1852 by Messrs. Merry and Cunningham. The freestone quarry of Ardeer is famous for a superior white stone, which is exported in large quantities. Dynamite works on a great scale have also been recently built. S. possesses the interesting remains of Kerelaw Castle, a stronghold of the Earls of Glencairn. Pop. (1871) of village, 3140; of parish, 5015.

Stew'ard, Lord High, was formerly the greatest officer of state in England, holding authority next in order to the sovereign. The office was long hereditary in the Earls of Leicester, till abolished by Henry III. on the death of Simon de Montfort. It is now created only for a temporary and particular purpose, such as to settle matters of precedence at a coronation, or to supply a president in the House of Lords at the trial of a peer. After the close of the proceedings in the latter case, the L. H. S. breaks the white rod, the emblem of his office, and dissolves the court. The *High Steward of Scotland* was an officer of great dignity in that country, created early in the 12th c. He was judge of the king's household, and the whole family of the royal palace was under his care. On the accession of Robert II. —the ninth heritable high steward—to the throne in 1371, the office merged in the crown, and in 1469 it was vested in the heir-apparent. *The Lord Steward of the Household* is the first great officer of the court. His duties are defined in the Black Book of the Household of Edward IV., and have only altered since that time with the modifications changes in society have produced. He is a member of the Privy Council, takes precedence of all dukes except those of royal blood, has sole direction of all the royal household below stairs, and the estate and accounts appertaining thereto. His authority extends over all the officers and servants of the household except those of the chamber, chapel, and stables. He is head of the Board of Green Cloth which formerly had authority to try all treasons and crimes within the range of the court. Its jurisdiction was entirely abolished in 1849. The salary of the Lord Steward of the Household, to which office a supporter of the administration in power is always appointed, is £2000 a year.

Stew'art, or, after the French orthography of the 16th c., **Stu'art**, the noblest and most unfortunate of Scottish families, traces its origin to Alan Fitz-Flahald, a Norman follower of the Conqueror, by him invested with the barony of Oswestry in Shropshire. His eldest son was ancestor of the Earls of Arundel, and by marriage of the Dukes of Norfolk; the second, Walter, entering the service of David I., received the lands of Renfrew, Hassendean, and Innerwick, along with the stewardship of Scotland. Of his lineal descendants, called Steward or Stewart from their hereditary office, the fourth, Alexander, was regent in Alexander III.'s minority, and defeated Hakon of Norway at Largs (1263); the sixth, Walter, commanded the Scottish west wing at Bannockburn (1314), and by his marriage with Marjory, Robert Bruce's daughter, became the father of Robert II. (q. v.). This Robert was the first of eight Scottish sovereigns — Robert III. (q. v.), who died of sorrow; the murdered James I. (q. v.); James II. (q. v.) and James III. (q. v.), both accidentally slain; James IV. (q. v.), who fell at Flodden, fighting against his English brother-in-law; James V. (q. v.), who died at the age of thirty; and Mary, Queen of Scots (q. v.), beheaded in her English prison. Mary's husband, the murdered Darnley (q. v.), was head of a younger—the Lennox—S. line, and uncle to Arabella S. (1575–1615), who, descended like him from Margaret Tudor's second marriage, died insane in the Tower of London. And from Mary's and Darnley's union sprang the four S. kings of England and Scotland—James I. (q. v.), Charles I. (q. v.), who died upon Whitehall scaffold, Charles II. (q. v.), and James II. (q. v.), ousted by his own daughter from the throne.—His only son, **James Frederick Edward S.**, born at St. James's Palace 10th June 1688, exactly a half-year later, was with his mother upon the sea, fleeing from England. He passed his boyhood at St. Germains, succeeding to the empty title of King (1701), but barred from the crown by the Act of Settlement and the party fiction of the warming-pan. The murmurs called forth by the Union suggested the Chevalier's first expedition (1707), from which he returned to France without setting foot in Scotland; the Treaty of Utrecht (1713) cost him his French asylum; and the intrigues with his half-sister, Anne, were interrupted by her death. George's unpopularity, and the espousal of the Jacobite cause by Ormond, Bolingbroke, and Mar, kindled new hopes—fatally dashed by Louis XIV.'s death and by the 13th November 1715, the day when Sheriffmuir was won and lost, and at Preston Derwentwater's 'handful of Northumberland fox-hunters' laid down their arms. James landed next month at Peterhead, but the game was up; so after six weeks of spiritless inaction he stole away, and, reaching France, madly dismissed his one sage councillor, Bolingbroke. Karl XII. of Sweden, his next supporter, had barely promised assistance when he fell before Frederikshald (1718); in the same year Alberoni's armada was wrecked off Finisterre; and James's marriage (1719) with Clementina Sobieski, grand-daughter of Poland's exiled king, served but to show that James to his father's bigotry added the vices of his uncle Charles. The princess quitted her husband, after bearing him two sons (1725); and he, having taken no active part in the '45, died at Rome, 12th January 1766.—**Charles Edward S.**, born at Rome, 20th December 1721, from early youth raised his adherents' hopes by signs of a bright, daring, chivalrous nature, and in his fifteenth year bore himself gallantly at the siege of Gaeta. In 1744 he repaired to Picardy, on a secret invitation to join the English expedition of Marshal Saxe; but storms dispersed the marshal's transports, and for eighteen months Charles was left hanging on, slighted by France, discouraged by the seeming lukewarmness of Scotland. Worn out at last, he flung himself desperately into the '45, with seven followers embarking on a brig at Nantes, to be parted at starting from the French man-of-war which, forming his only convoy, bore all his arms and stores. The brig held on; on the 18th of July Charles landed in the Hebrides, and in a month upreared the standard of King James VIII. in the valley of Glenfinnan. Wavering chieftains, talked over by the Prince's winning tongue, flung prudence to the winds. His forces rapidly swelled; and eluding General Cope, he entered Perth, then marching southward seized Edinburgh (September 17) without stroke of sword. Cope meantime hurried back by sea, and on the 22d his forces, 2300 disciplined soldiers, met Charles's 2500 Highlanders at Prestonpans. In five minutes' time the clansmen's impetuous valour had won the day; and after six weeks of Holyrood courts and balls, Charles started at the head of 5600 men on his famous march upon London. Carlisle surrendered, Manchester furnished 200 volunteers; but Englishmen as a body held aloof, even in Catholic Lancashire.

The Hanoverian troops were closing in, and at Derby the Prince, for all his passionate protests, was forced to consent to a retreat (6th December)—just at the moment when London was in an uproar of alarm; when Henry, his brother, had orders to land with 10,000 Frenchmen on the southern coast; when the great Duke of Norfolk, with Watkin Wynne, the 'King of Wales,' stood pledged to espouse the Stuart cause. *Vestigia nulla retrorsum* had hitherto been Charles's motto, no valour might atone for its abandonment. In vain did Murray, wheeling at Penrith, check Cumberland's pursuit; Carlisle's little Jacobite garrison capitulated to the Duke. In vain at Falkirk (17th January) the clansmen gained in ten minutes an easy victory over Hawley's outnumbering forces; the conquerors must raise the siege of Stirling. On the 16th of April fell the decisive blow, when, at Culloden, weariness, hunger, and their own jealousies fought with the 'Butcher' against the Highlanders, Sedgemoor avenged itself upon the Stuarts, the Bloody Assize upon their partisans. Happy for Charles had he fallen too, but he was yet to put Northern faith to harder proof. With £30,000 set on his head, he wandered among the poorest for full five months, now on the mainland, now in the Western Isles, disguised at one time as Flora Macdonald's 'muckle maid,' the guest at another of seven robbers, the Men of Glenmoriston. He sailed from the Highlands (20th September), was royally received in France, and as ignominiously expelled (1748), in accordance with the Peace of Aix-la-Chapelle. A residence of some years at Liège was only broken by secret visits to London, in one of which he is said to have witnessed the coronation of George III., in another to have turned Protestant. However that may be, he was certainly orthodox enough when on his father's death (1766) he returned to Rome, hoping the Pope would recognise his claims. Rome, Spain, and France alike refused such recognition, though the last-named power revived in 1770 the dream of his restoration, and even invited him again to Paris. He came, and visited the French minister Choiseul—drunk. The craving for drams, acquired in his wanderings, coupled with his infatuation for a Scotch mistress, had already estranged the Prince's English friends; France also henceforth wisely abstained from meddling in his affairs, beyond procuring him a wife (1772) in the Countess of Albany (q. v.). Ranke, in his *Gräfin von Albany*, has vividly described the pitiful tragi-comedy down to the closing scene, in which, 'worn out with liquor and harlots,' the heir of twelve sovereigns died at Rome, 30th January 1788. He lies at Frascati, under Canova's monument, raised at the charge of George III.; a nobler monument are the Scottish ballads, where 'Bonnie Prince Charlie' yet lives transfigured in his people's memory.—**Henry Benedict S.**, born at Rome, 26th March 1725, is described by the poet Gray (1740) as 'having more spirit than his elder brother.' In his twenty-third year, however, he accepted a cardinal's hat from Benedict XIV, and on Prince Charles's death only put forth his claims by striking a medal with the legend 'Henry IX., King of England by the Grace of God, but not by the will of man.' The Revolution cost him two rich French livings, the abbeys of Auchin and St. Amand; and the plunder of his Frascati villa by the French revolutionary troops (1798) drove him a penniless fugitive to Venice. A pension of £4000 graciously offered by George III. was gratefully received; and Cardinal York, dying at Frascati, 13th July 1807, bequeathed to the Prince Regent the crown jewels which James II. had carried away with him in 1688.

To the S. family also belonged (1) the Dukes of Albany, Earls of March, and Lords of Annandale and Man; (2) the Earls of Fife and Menteith; (3) the Lords Avandale, Ochiltree, and Castlestuart, and Earls of Castlestuart; (4) the Lords Methven; (5) the Lords Doune, Earls of Moray, and Lords St. Colme; (6) the Earls and Marquises of Bute, Lords Wharncliffe, and Lords S. de Rothesay; (7) the Earls of Angus; (8) the Earls of Darnley, Earls and Dukes of Lennox, and Lords of Aubigné, &c., whose kinship to the royal line may be found in the S. Genealogies of Duncan Stewart (Edinb. 1739), Noble (Lond. 1795), and Andrew Stuart (Lond. 1798). See also Chalmers' *Caledonia* (1807-24); Jesse's *Memoirs of the Pretender* (new ed. Lond. 1858); the Marchesa Campana de Cavelli's *Les derniers Stuarts à Saint-Germain à Laye* (2 vols. Par. 1871); and Ewald's *Life and Times of the Prince Charles Edward* (2 vols. Lond. 1875).

Stew'art, Alexander Turney, an American millionaire, was born near Belfast, Ireland, 27th October 1802, studied at Trinity College, and emigrated in 1818 to New York, where he taught classics and mathematics. Having lost in trade the little money he had taken with him, he returned to Ireland, disposed of some remaining property, and investing in Irish laces, returned to New York to open in Broad Street (1823) the store, which subsequently expanded into the largest dry-goods establishment in the world, with branches in England, Scotland, Ireland, France, and Germany, besides factories for woollens, carpets, hosiery, &c., in the United States, England, and Scotland, the whole employing some 8000 persons. S. also became a large holder and improver of real estate in and around New York, Saratoga, &c., and eventually acquired a fortune only, if at all, inferior to that of Astor (q. v.) and that of Cornelius Vanderbildt, the railway speculator. He despatched a vessel with breadstuffs to Ireland during the famine of 1846, erected the model Garden City on Long Island, near Brooklyn, established a home for working-girls in New York, and contributed large donations to the sufferers by the Chicago fire (1871) and the Franco-German War. He was president of the United States Commission at the Paris Exhibition of 1867, but took almost no other part in public affairs. He died childless, 10th April 1876, leaving his estate, with the exception of certain legacies, to his wife. A search for next of kin called forth over 2000 claims, but a more startling incident was the mysterious abstraction of the body of the deceased in November 1878. The perpetrators of this ghastly deed, still undetected, are supposed to have been actuated by the hope of ransom.

Stew'art, Balfour, LL.D., F.R.S., an eminent physicist, was born at Edinburgh, November 1, 1828. After passing several sessions at the Universities of St. Andrews and Edinburgh, he went out to Australia, where he engaged in business from 1852 to 1854. In 1855 he returned to England, served for a few months in Kew Observatory, of which after being for three years assistant to Forbes, professor of natural philosophy at Edinburgh, he was appointed director (July 1, 1859). He has also filled the chair of natural philosophy at Owen's College, Manchester, since July 7, 1870. As a meteorologist he enjoys a wide reputation. He is also one of the founders of spectrum analysis, being the first who experimentally established the equality between the radiative and absorptive bodies (1859). For these researches he obtained the Rumford medal of the Royal Society in 1868. In conjunction with Professor Tait he investigated the Rotation of a Disk in Vacuo (*Philosophical Transactions*, 1865-66). His chief works are *Researches in Solar Physics* (1866) jointly with De la Rue and Loewy, *Elementary Treatise on Heat* (1866; 3d ed. 1877), *Elementary Lessons in Physics* (1870; new ed. 1878), the *Physics Primer* (1872) in 'Macmillan's Series,' the *Conservation of Energy* (1873) in the 'International Scientific Series,' and jointly with Professor Tait two remarkable speculative works entitled *The Unseen Universe* (1875; 7th edt. 1878), and *The Paradoxical Philosophy* (1878).

Stew'arton, a town of Ayrshire, Scotland, on the right bank of the Annock, 5 miles N.W. of Kilmarnock by the Glasgow and Barrhead railway. It has five churches (Established, Free, United Presbyterian, Congregational, and Wesleyan), three banks, a handsome public school erected in 1875 and capable of accommodating upwards of 600 pupils, a public hall with reading and recreation rooms attached. Long noted for the production of Scotch bonnets, it has also manufactures of carpets, yarn, needlework, spindles, &c. A cattle-fair is held twice a year. The river is here crossed by three bridges, and close to the town the railway crosses the Annock by a lofty bridge of 10 arches. Pop. (1871) 3299.

Stew'art, Dugald, a Scottish philosopher, was born in Edinburgh, 22d November 1753, educated at the High School, passed through the regular course of study at the Edinburgh University, and attended the lectures of Dr. Reid in Glasgow. In 1772 he began to assist his father the professor of mathematics in the Edinburgh University, and in 1775 he was chosen joint professor; but the lectures which he delivered as Adam Ferguson's substitute in 1778 79 brought his philosophical ability into prominence, and on Ferguson's resignation in 1785 he was appointed to the vacant chair. He soon proved himself, in the words of Lord Cockburn, 'one of the greatest didactic orators;' and students were attracted by his fame even from the Continent and America. In 1809 his health gave way, and though he continued to be nominal professor till 1825, his work

was done by Dr. Thomas Brown, and he lived in peaceful but studious retirement at Kinneil House, near Bo'ness, which had been placed at his service by the Duke of Hamilton. His second wife, Helen d'Arcy Cranstoun, was a member of the Cranstoun family celebrated by Sir Walter Scott; and endowed as she was with rare gifts of intellect and character, she rendered the philosopher no small assistance in his work.' S. died at Kinneil House, 11th June 1828. S. was a fairly voluminous author, especially in his later years. The first volume of *Elements of the Philosophy of the Human Mind* appeared in 1792, the second in 1814, and the third in 1827. In 1793 he published *Outlines of Moral Philosophy* for the use of his students. The biographical sketches of Adam Smith, William Robertson, and Thomas Reid, originally read before the Royal Society in 1793, 1796, and 1802 respectively, were printed together in 1811. His *Philosophical Essays* appeared in 1810. The first part of his famous Dissertation on the progress of Philosophy was prefixed to the Supplement of the fourth and fifth editions of the *Encyclopædia Britannica*, 1816; and the second part followed in 1821. His last work, *Philosophy of the Active and Moral Powers*, appeared in 1828, only a few weeks before the author's death. A collective edition of S.'s works was published at Cambridge, Massachusetts, 7 vols. 1829; and again in 1831. The best edition is that of Sir William Hamilton and Professor Veitch (11 vols. 1854–58): a Memoir of S. by Professor Veitch occupies part of vol x. Lieutenant-Colonel Matthew S., the philosopher's son, unfortunately destroyed his father's MS. of a *Philosophy of Man as a Member of a Political Association*. It is rather as a literary expositor of philosophical subjects than as an original thinker that S. attained his fame. He is at best a continuator of the school of Reid, but he is a continuator who knows not only how to state and defend, but how to develop and adorn.

Stew'artry, in Scotland, a division of the crown-lands formerly under the jurisdiction of a steward appointed by the king. Besides the civil powers of a sheriff, the steward exercised an extended criminal jurisdiction, but by Act I. Vict. c. 39 the names steward and steward-clerk, &c., were abolished from the statute in favour of sheriff, sheriff-clerk, &c. The only trace still remaining of the older jurisdiction is in the designation of Kirkcudbright as a S. instead of a county or shire. While the territory of Galloway (q. v.), comprising Wigton and Kirkcudbright, was still in a strict sense only a tributary dependency of Scotland, it retained its old Celtic proprietary and its peculiar laws and usages. Ruled for a long period by its own dynastic lords, among the most powerful under the Scottish crown, it eventually fell to the Comyns, who were overthrown by Bruce. About this date (1306) it would seem that E. and Central Galloway were formed into the existing S., while W. Galloway or Wigton had already been formed into a Shire (q. v.). When in 1747 heritable jurisdiction was removed, the S., freed from certain regalities and baronies, was placed under a steward-depute, whose functions were almost identical with those of a sheriff-depute. A humbler survival of the old proprietary is seen in the name common in Scotland of land-steward—the grieve or bailiff of a farm or estate.

Stew'ing, a method of cooking both meats and vegetables, in which only a sufficient quantity of water is placed with the material to be cooked into a stew-pan, and the whole is allowed to simmer gently till quite done. In S. the food is chiefly cooked by its own juice, and the entire contents of the stewpan form one dish.

Stey'er, or **Stei'er** (officially spelt Steyr), a town of the crownland of Upper Austria, 20 miles N.E. of St. Valentin by rail, has a parish church (Gothic) built in 1447, a fine 'square,' and most extensive manufactures of iron and 'Steier-steel' goods. Pop. (1869) 13,392.

Stich'omancy (Gr. *stichos*, 'a line,' and *manteia*, 'divination'), a form of Bibliomancy (q. v.) in which the future is augured from lines in a book taken haphazard.

Stick'ing-Plaster, or **Court-Plaster**. S.-P. is prepared from resin, in powder, 2 parts; litharge plaster, 16 parts; and hard soap, 1 part. The plaster should be melted with a gentle heat, and the resin and soap, first liquified, should be added, and the whole mixed and then spread upon linen.—C.-P. is thus prepared: dissolve separately 1 oz. of isinglass in 8 oz. of hot water, and 2 drachms of gum-benzoin in 2 oz. of rectified spirits. Strain and mix. Several coats of this mixture are then to be applied to a piece of silk stretched on a frame, or to gold-beater's skin. A solution composed of 1 oz. of Chien turpentine in 2 oz. of tincture of benzoin is then to be applied to the other side of the silk.

Stick'-insects, the name applied to certain very remarkable insects belonging to the order *Orthoptera* (q. v.), and to the family *Phasmidæ*. The body exactly mimics a small piece of dried twig, and when at rest the legs are disposed in an irregular manner so as to increase their resemblance to pieces of stick.

Stick'leback (*Gasterosteus*), a genus of freshwater *Teleostean* fishes, distinguished by the long and compressed shape of the body, and by the ventral fins being provided with strong spines. These fishes are noted for their pugnacious habits, their nest-building instincts, and the care they take of their young. The three-spined S. (*G. aculeatus*) is common in all British brooks and ponds. It has three dorsal spines. It constructs a nest composed of vegetable matter cemented round some aquatic plant by a glutinous substance secreted by the fishes themselves. The entrance to the circular nest is at the top, and the eggs are of a bright yellow hue. Both male and female guard the nest with care and jealous attention, and ward off the attacks of other fishes. The ten-spined S. (*G. pugnitius*) is another freshwater species, but the fifteen-spined S. (*G. spinachus*) or 'Sea-adder' is a marine form, attaining a length of from 5 to 7 inches. It is of a greenish hue above, and has a long snout, the lateral line being keeled. Other species are the quarter-armed S. (*G. gymnurus*) and the half-mailed S. (*G. semiloricatus*).

Stiel'er, a famous German cartographer, was born at Gotha 26th February 1775, studied law at Jena and Göttingen, received an office in the ministerial department at Gotha in 1797, became a member of council in 1829, and died 13th March 1836. His principal works, masterpieces of art and science, are a *Hand-Atlas*, issued in conjunction with Reichard (75 maps, Gotha 1817–33; new ed. by Petermann, 90 maps, 1872), and a *Schul-Atlas* (Gotha 1821).

Stig'ma. See PISTIL.

Stigmatisa'tion. See HÆMIDROSIS.

Stilett'o (Ital. from Lat. *stilus*, 'a pointed instrument used in writing'), a short pointed dagger introduced in the Middle Ages, and even yet well known in Southern Europe.

Stil'icho, the last great Roman general, was born about the middle of the 4th c. A.D. His father is said to have been a captain of the Vandal auxiliaries incorporated in the Roman army by Valens, and to his sympathy with these Gothic tribes who furnished now alike the defenders and the enemies of Rome, his subsequent success was probably in large measure due. At an early age S. attracted the attention of the great Theodosius, who held the whole Roman Empire firmly under his power, and was employed by him in several missions of importance, being ultimately made (384) commander-in-chief of the imperial armies. In 394 he and his wife Lerena, a niece of the emperor's, were sent to Rome as guardians of the youthful Honorius, and on the death of Theodosius (395) S. became practically ruler of the Western Empire. For the next twelve years his life was one continuous and, till the last moment, successful struggle against overwhelming odds, in the conduct of which he exhibited military and political talents of the very highest order. His enemies were the ever-returning swarms of barbarians and the jealous court of Constantinople, whose mutual intrigues it required the utmost vigilance to elude. The news of the death of Theodosius excited the Germans and Gauls to revolt, and after they had been subdued in one swift summer's campaign, S. turned to the E., where Rufinus, the able but unscrupulous minister of the late emperor, was using the young Arcadius as a foil for his ambition. By dexterous negotiations, the Gothic auxiliaries who formed nearly the whole of the Byzantine army were induced to turn traitor, and Rufinus was cut to pieces at the moment of his expected triumph. Relieved from this enemy, S. had immediately to turn his attention to another, for in 396 Alaric appeared in Greece with an immense host, and though blockaded in the Peloponnesus, managed to escape, and by the aid of Arcadius defied the Western general for nearly

eight years. At last two crushing defeats drove him from Italy, and in 404 Rome for the last time beheld a triumph over the Goths. No sooner was he effectually humbled than S. was forced to enter into treaty with him, in order that the Byzantine court might be kept employed, and so prevented from interfering with S.'s designs on the imperial throne. Even before the death of Theodosius, Honorius had been betrothed to Maria, the daughter of S., but now the latter proposed to marry his son Eucherius to Placidia, the sister of the two reigning emperors and their heiress should they die childless. But not even his great services could excuse such an act of ambition, and both Pulcheria, the widow of Arcadius and guardian of his infant son Theodosius, and Honorius, whose hopes of an heir had been revived by his marriage with Æmilia, the sister of his late wife, exerted themselves to the utmost to thwart him, and as soon as the formidable invasion under Radagaisus had been checked, the proposed occupation of Illyricum was made a pretext for inflaming the minds of the soldiers against him, and, suddenly deserted by his faithless legions, S. was seized and put to death at Ravenna, August 23, 408. For an account of S.'s life and character the English student need not go beyond Gibbon's *Decline and Fall of the Roman Empire.* The principal ancient authorities are the Church historians, the pertinent parts of whose voluminous works can be learned from the notes in Gibbon.

Still. See DISTILLATION.

Still, John, D.D., born at Grantham, in Lincolnshire, about 1543, studied at Christ's College, Cambridge, became Master of St. John's (1574) and of Trinity (1577), was made bishop of Bath and Wells (1592–93), and died 26th February 1607–8. S. has an obscure place in English literature as the supposed author of the second oldest comedy in the language, *Gammer Gurton's Needle*, a piece of low rustic humour in rhyme, turning on the loss and recovery of the needle with which Gammer Gurton was mending the breeches of her man Hodge.

Stillicid'ii Ser'vitus. See EAVESDROP.

Still'ingfleet, Edward, born at Cranbourne, Dorsetshire, 17th April 1635, passed from the grammar-school of his native town to St. John's College, Cambridge, of which he became a fellow. Taking holy orders, he was successively rector of Sutton in Bedfordshire (1657), preacher at the Rolls Chapel, London (1664), rector of St. Andrews, Holborn, and lecturer at the Temple (1665), canon of St. Paul's (1667) and Canterbury (1669), chaplain-in-ordinary to the king (1670), archdeacon of London (1677), and bishop of Worcester (1689). He battled hotly with Romanists, Atheists, and Unitarians, rather employing borrowed and arrogant arguments than 'the softness, gentleness, and activity' ascribed him by Clarendon. He got the best of Dryden in one controversy, but a defeat by Locke is said to have hastened his death, which took place at Westminster, 27th March 1699. His *Collected Works* (1710), filling six folio volumes, include *Irenicum, a Weapon Salve for the Church's Wounds* (1661); *Origines Sacræ* (1662); *Discourse concerning the Idolatry practised in the Church of Rome* (1671); and a *Discourse in Vindication of the Doctrine of the Trinity* (1697).

Still-Life, in painting, is the designation of subjects that are *still* or without *life*, as dead game, fruit, flowers, vases, and *bric-à-brac.*

Stim'ulants may be defined as medicines which, when given internally, increase the power and force of the circulation, and are used by the physician for such purposes; or as medicines which increase the sensibility of the nervous and muscular system, and the secretions of the mucous membrane, and give energy to the whole system. Wood includes under *Cardiac* S., ammonia, alcohol, turpentine, and digitalis. Neligan divides S. into general and special; but the distinctions are confused. Squire divides S. into spinal and stomachic. The *spinal* S. are arnica, cannabis indica, cantharis, ergota, nux-vomica, phosphorus, and strychnia. The *stomachic* S. are ammonia, anethum, anisum, armoracia, assafœtida, cajuputi, capsicum, chloroform, cardamomum, carum, caryophyllum, cinnamomum, coriandrum, fœniculum, macis, mentha, myristica, pimenta, piper, sinapis, spiritus vini gallici, and zingiber. Electricity, galvanism, and magnetic electricity also act as stimulants.

Sting, the name given to the offensive apparatus occurring as a terminal appendage to the abdomen of certain insects, notably the Bees, Wasps, Ants, and other *Hymenoptera* (q.v.). The S. or *aculeus* is a sharp-pointed appendage protected by two lateral processes. A poison-gland communicates with the S., the secretion of this gland being introduced by the S. into the wound.

Sting-ray (*Trygon*), a genus of Rays, or *Raiinæ*, in which the tail is armed at about the middle of its upper surface with a very prominent spine, the edges of which are serrated. The tail itself is long and slender, and nearly wants a terminal fin. The *Trygon pastinaca*, also named the 'Fireflaire,' is the only British species. It is common in the S. coasts of Britain, and also in the Mediterranean Sea. Its colour is red, and its flesh is said to be unpalatable. Other and allied species inhabit warm seas.

Stink-wood, so called from the offensive smell of the fresh-sawn timber, is *Oreodaphne bullata*, a S. African forest tree, of which the fine-grained dark-coloured wood is used in cabinet work. The better specimens have much the appearance of rose-wood, and take a fine polish. *Fœtidia Mauritiana*, known as 'le bois puant' in Mauritius, is also called S.-W.: it furnishes good furniture wood.

Stipe (Lat. *stipes*, 'a stalk'), in botany, is the foot-stalk (*i.e.*, the portion up to the lowest pinnæ) of fern fronds, as also the stem supporting the pileus or cap in the mushroom-shaped fungi.

Stipe. See FEATHER GRASS.

Sti'pend is the provision for the support of the parochial clergy of the Church of Scotland. It consists of payments of money, or grain (see FIARS), or both, varying in amount according to the state of the free Teinds (q. v.), or of any other fund for the purpose. The terms at which S. is payable are Whitsunday and Michaelmas. See AUGMENTATION, PROCESS OF.

Sti'per Stones, or Arenig formation, the lowest series of rocks in the Silurian system. It consists of several thousand feet of flags, shales, and siliceous or quartzose sandstones with contemporary igneous rocks, well developed in Merionethshire, Shropshire, and in the Lake district. The formation is analogous to the calciferous sandstones, &c., in the state of New York. About eighty species of fossils have been detected in the British rocks of this period, though, with the exception of annelid-burrows, specimens are not abundant.

Stip'ple. See ENGRAVING.

Stip'ules in botany are leaf-like or scale-like appendages at the base of the leaf-stalk, or on the node of a stem. In a great number of plants they are entirely wanting. When present there are generally two. They vary exceedingly in size and appearance, sometimes exactly like the true leaves except that they have no buds in their axils, or looking like the leaflets of a compound leaf, sometimes apparently the only leaves of a plant; generally small and narrow, sometimes reduced to minute scales, spots, or scars, sometimes united into one opposite the leaf, or more or less united with, or *adnate* to the petiole, or quite detached from the leaf, and forming a ring or sheath round the stem in the axil of the leaf. *Stipellæ*, or secondary S., are similar organs, sometimes found on compound leaves at the points where the leaflets are inserted.

Stir'ling, one of the oldest and most interesting and picturesque towns of Scotland, situated on the S. bank of the Forth, 29 miles N.E. of Glasgow and 36 N.W. of Edinburgh by railway. Like old Edinburgh it lies on a steep basalt ridge, the precipitous, rocky brow of which, 350 feet high, crowned by the romantic castle, overlooks the fertile Carse of S., threaded by the sinuous, silvery 'links' of Forth. The magnificent view westwards, across the rich vale of Menteith, extends to the noble rampart of the Grampians jagged by the peaks of Ben Lomond, Ben A'an, Ben Ledi, and Ben Venue. The Ochills form a background to the N.E., and the Campsie Hills close the prospect to the S., while in the vicinity rise Craigforth, the Wallace Monument on the Abbey Craig, and the beautiful remains of Cambuskenneth Abbey. The castle, of unknown antiquity, became a favourite royal residence under the Stewarts, and was the birthplace of James II. and James V., the latter of whom was crowned

here. James III. strengthened the fortress and added the Parliament House; James V. built the palace, a quadrangular edifice; and James VI. (1594) erected the Chapel-Royal, now used as an armoury. The 'Douglas Room' was the scene of the murder of William, Earl of Douglas, by James II. One of the four strongholds which, by the articles of the Union, must be kept in repair, the grey old castle is still used as a military station. On the spacious esplanade a statue of Bruce was unveiled, 24th November 1877. The cemetery adjoining has statues of Knox and other worthies of the Reformation, Covenant, and Secession. The famous 'Back Walk' that skirts the rock below the castle was 'contrived' in 1724. The Greyfriars' Church (divided since the Reformation into the East and West Churches), a fine specimen of Later Pointed Gothic, was erected by James IV. (1494), and extended by Archbishop James Beaton. Here Knox preached on the coronation of James VI. (1567). 'Mar's Work' is part of a mansion designed by the Earl of Mar; 'Argyle's Lodging,' one of the finest specimens of Scottish architecture, built by Alexander, Earl of Stirling, is now a military hospital. S. has 16 places of worship, including the episcopal church of the Holy Trinity, erected at a cost of £14,000, and opened 1878. There are also a town-house, with a square tower, and a council chamber with a spire 100 feet high; a corn exchange; Cowan's Hospital, with a fine Guild Hall; the new county buildings, completed in 1876; a High School; the Smith Institute; a free public reading-room, museum, and picture-gallery opened in 1874; militia barracks, and extensive barracks for married soldiers, still (1878) in course of erection. Besides the Royal Gardens below the castle, which still contain the 'King's Knot' and terraces, S. has a public 'King's Park' of 163 acres. The Forth is spanned by old S. Bridge, which existed prior to 1571, by a modern stone bridge, and by two railway bridges, one of iron, the other of wood. S. is on the Caledonian Railway, and is the centre of two other lines. The industries are woollens, carpets, tanning, and brewing; there is also an active trade in mining and agricultural products. The Forth is navigable thus far to vessels of 200 tons, and passenger steamers run to and from Leith. S. publishes four weekly newspapers, and unites with the Dunfermline burghs in returning one member to Parliament. Pop. (1871) of the parish 12,014; of the parliamentary borough 14,279. *Stryvelyne* or *Estrivelin* first emerges in history as one of the four towns forming the Convention of Burghs. Wallace (q. v.) achieved his brilliant success of 1297 near S., which was taken by Edward I. after a three months' siege in 1304. One mile and a half S.E. is the field of Bannockburn (q. v.). The castle, taken by Monk in 1651, successfully resisted the Highlanders in 1745.

Stir'ling, James Hutchison. LL.D., was born at Glasgow, June 22, 1820, entered Glasgow University in 1833, and studied with distinction for nine consecutive winter sessions in Arts and Medicine, graduating in the latter faculty in 1842. He practised in Wales for some years, but on the death of his father in 1851 relinquished his profession, and devoted himself wholly to metaphysics and literature. S. subsequently spent six years in France and Germany. He has written *The Secret of Hegel, being the Hegelian System in Origin, Principle, Form, and Matter* (2 vols. 1865); *Sir William Hamilton, being the Philosophy of Perception* (1865); *Jerrold, Tennyson, Macaulay, and other Essays* (1868); *Address on Materialism* (1868); *As Regards Protoplasm* (1869; 2d ed. 1872); *Lectures on the Philosophy of Law*, &c. (1873). He also translated Dr. Albert Schwegler's *Geschichte der Philosophie in Umriss*. Of this translation the seventh edition appeared in 1879. S.'s latest original work is *Burns in Drama, together with Saved Leaves* (1878), which is perhaps in some respects the finest effort of his genius. S. keenly opposes the biological theories of Häckel and Huxley, and is not only a profound metaphysician, but a trenchant and incisive critic. He has not worked out a distinct system of his own, but he is a singularly independent and fearless thinker, and blends a rugged vigour and sagacity of intellect in abstract speculation with the picturesque eloquence of literary art.

Stir'ling, William Alexander, Earl of, a Scottish poet and politician, belonged to a family which since the middle of the 15th c. had been settled in Clackmannanshire, where it held the lands of Menstrie. The poet, who was the seventh baron of Menstrie, was born in 1580, in his youth travelled on the Continent as tutor and companion to the Earl of Argyle, and followed James VI. to London, where his talents and accomplishments raised him high in favour at court. Knighted in 1614, he obtained in 1621 a grant of Nova Scotia in America (though it had previously been discovered and partly occupied by the French), of which he was appointed 'hereditary lieutenant,' with the right of creating an order of baronetcy on payment of one hundred and fifty pounds. In 1626 he became Principal Secretary of State for Scotland, in 1630 was created Earl of S., and died in London, 12th September 1640. S. wrote *Darius, a Tragedy* (1603); *Aurora, containing the First Fancies of the Author's Youth* (1604), a hundred lachrymose sonnets in praise of an obdurate fair; *The Monarchicke Tragedies* (1604, 3d ed. 1617); *An Elegie on the Death of Prince Henry* (1612); *Doomesday* (1614); *A Supplement of a Defect in the Third Part of Sidney's Arcadia* (1621); *An Encouragement to Colonies* (1625); *A Map and Description of New England*, &c. (1630). His complete works (except the *Aurora*), entitled *Recreations with the Muses*, were published in 1637. S. is a grave moralising poet, elegant in language and melodious in verse. He was highly esteemed in his own time, and even in the next century. Swift pronounced S. and Drummond of Hawthornden to be 'Scottish bards of highest fame.'

Stir'lingshire, a fertile county of Scotland, on the isthmus between the Firths of Forth and Clyde, and forming part of the border land between the Highlands and Lowlands. Area, 298,579 acres; pop. (1871) 98,218. It is bounded N. by Perth and Clackmannan, from which it is separated by the Forth, E. by the Firth of Forth and Linlithgow, S. by Lanark and Dumbarton, and W. by Dumbarton and Loch Lomond. The parish of Alva forms a detached portion of S., and there is another small portion towards the W. extremity of the Ochils. The district of the 'Carse,' 36,000 acres in extent, stretching along the Forth, is only a few feet above the level, but in the W. and S. the surface is varied by tracts of heath, moss, and pasture. In the N.W. is Ben Lomond (q. v.), in the N.E. part of the Ochils and in the S. the lower Campsie Fells. Besides the Forth, the streams of S. are the Avon, Allander, Kelvin, Endrick, Bannock, Carron, Allan (for about a mile), &c. The county includes rich coal and iron districts, and in 1877 had 4 out of 7 furnaces returned for S. and Linlithgow, which together yielded 55,241 tons of pig-iron. There are some 40,000 acres of oak coppice, yielding a large supply of bark. The soil is varied, and agriculture is in a highly proficient state. Wheat and beans are abundantly produced in the Carse, and potatoes and turnips in the higher 'dry-field' farms. In 1876 there were 30,655 acres in corn crops, 9503 in grain crops, 24,036 in clover, sainfoin, and grasses in rotation, 45,009 in permanent pasture, exclusive of mountain-land and heath. The live stock comprised in the same year 30,225 cattle, 115,610 sheep, 2297 pigs, and 4801 horses. The manufacture of carpets, tartans, plaidings, shawls, and other woollens is carried on at Bannockburn, Cambusbarron, &c. There are large ironworks at Carron (q. v.); cotton-mills at Fintry, Balfron, and Milngavie; printfields at Denny, Milngavie, Lennoxtown, &c.; tanworks at Stirling and Falkirk; and shipping-yards at Grangemouth. A member is returned to Parliament by the county.

Stir'pes, Succes'sion by, is a term of Scotch law, denoting that an inheritance is distributed among representative *families*, and not among the individual members of such families.

Stirr'up Cup, a parting drink, from the former custom of travellers in Scotland receiving a parting cup from the host when their feet were in the stirrups.

Stirr'ups are metal rings or loops with a flat 'footrest' suspended by leathers from a saddle to support the feet of a horseman. No trace has been found of their use prior to the 6th c., and they are first mentioned under the name *scalæ* in a work by Emperor Mauricius. S. were known in England before the Norman Conquest, but they do not appear to have come into general use till the 12th or 13th c. S., on shipboard, are short ropes pendent from a yard and having eyes through which a foot-rope passes for sailors to stand on. Stirrup, in machinery, denotes a bent strap for securing one object to another.

Stitch in the side is a popular designation for the peculiar pain often experienced in various affections of the lungs and its lining membranes, such as pleurisy, pneumonia, and phthisis. It is sometimes also applied to the pain felt in pleurodynia.

Stitch'wort (*Stellaria*), a genus of *Caryophyllaceæ*, of which there are about 70 species (7 British)—all slender herbs, widely distributed through the temperate and cold regions of the globe. The best-known members are the great S. (*S. Holostea*), which from its large white flowers in early summer is an ornament of hedgerows and pastures; wood S. (*S. nemorum*), frequent in the N. of England and Scotland in shady places, but not so striking as the above; and the chickweed (*S. media*), native through Arctic and N. temperate regions, and now a cosmopolitan naturalised weed. The great S. was supposed to cure 'stitch' in the side (Gerard, *Herbal*, p. 140), hence the name.

Stiv'er, a Dutch coin, valued at 5 centimes or $\frac{1}{20}$th of a guilder, and therefore equivalent to about one penny sterling.

Stoat. See ERMINE.

Stobæ'us Joannes, a learned Greek, native of Stobi in Macedonia, who probably lived in the 6th c. of our era. In the course of his extensive reading he made extracts of the most important passages, sometimes verbatim, sometimes merely epitomes, which he put together under subjects for the instruction of his son Septimius. Photius has given an alphabetical list of 500 Greek writers from whom he made extracts, which are invaluable, as most of the originals have perished. He himself called his anthology, *Eklogōn, apophthegmatōn, hypothēkōn, biblia tessara.* It has come down in 3 books, forming two separate works. The first and second books are usually called *Eklogia physikai, dialektikai kai ēthikai*, and the third *Anthologion*. The *editio princeps* of the *Eklogai* was published in 1575 at Antwerp. The best modern edition of the *Eklogai* is that by A. H. L. Heeren (2 vols. Gött. 1792-1801), and of the *Anthologion* by T. Gaisford (4 vols. Oxf. 1822; reprinted at Leipzig 1823 and 1853). A complete edition of the works of S. was published by Tauchnitz (3 vols. Leip. 1838).

Stock (originally 'Stock-gilloflower,' to distinguish it from the stemless *Dianthus caryophyllus*, the clove-pink, called 'gilloflower') has passed beyond its original application to *Matthiola incana*, to be the accepted English name of the genus, and of some allied cruciferous garden plants. *Matthiola* (named after *Matthiolus*, an Italian physician) is a genus of herbs, of which there are about 30 species dispersed through Europe, N. Africa, and W. Asia, and one belonging to the Cape. The *M. incana* is a plant of W. Europe, Canaries, and Levant, occurring in Britain only in the Isle of Wight. It is the source of numerous varieties or breeds ranging under the names 'Queen S.' and Brompton S., which are treated only as annuals or biennials in the garden. *M. tristis*, a low-growing species with narrow hoary leaves and dingy brown flowers, a native of S. Europe, is best known as the Night-scented S. *M. annua* is the source of Ten-week S. group, and *M. græca* of the smooth-leaved annual stocks. *M. sinuata*, a diffuse herbaceous species, reaching as a native the shores of W. England and Ireland, has pale lilac flowers, fragrant at night, but it does not appear to be cultivated. The so-called Virginia S. (*Malcolmia maritima*) is indigenous to the coasts of S. Europe, and has become a favourite garden annual.

Stock'broker. See EXCHANGE, STOCK.

Stock-Fish, a general name given to such fishes as cod, ling, tusk, &c. These fishes are largely used in a dried state, and are split up on being caught, gutted, washed, partly boned, and then placed in salt vats and heavily weighted. After an interval they are taken from the vats, washed and laid out on rocks to dry, the flesh then becoming white. Gathered into bales, the S.-F. are ready for the market. S.-F. are usually prepared in northern lands. In Scotland, Canada, and Newfoundland the curing of S.-F. is a great industry.

Stock'holm (Sw. *stock*, 'a stake,' or Lapp. *stock*, a 'sound' or 'strait,' and Sw. *holme*, 'an islet'), the capital of Sweden, lies on the outlet of the Mælar Lake into an island-studded bay of the Baltic (here called *Saltsjö*), and is built partly upon islands, partly on the mainland. Its beautiful situation has gained for it the name of 'Queen of the Baltic.' Not even in Venice is the water communication more easy and extended. The town proper occupies three islands, on the largest of which, Stadsholmen, is the king's palace, built by Tessin on the site of the old 'Adelshus' (burnt 1697), a plain, massive quadrangular building 408 feet long by 381½ broad, with wings at its corners, three of which are 161 feet long by 50 feet broad. It contains a festival hall called 'Hvita Hafvet,' 115 feet long and 38-35½ feet broad, and in the N. wing is the Royal Library. S. of the palace are an obelisk (98 feet) commemorating the deeds of citizens of S. in the Russian war of 1788-90, Gustaf III.'s statue by Sergel, the finest in S., the Cathedral of St. Nicholas (founded 1264, almost entirely rebuilt 1736-43), Italian externally, internally Gothic, with a spire 185 feet high, and the Exchange (1776). Also on Stadsholmen are the New Masonic Temple (1877), occupying the old Riddarhus (1648-70), on the purchase and fitting up of which £101,250 has been expended, with Gustaf Vasa's statue (1773) in front, the townhouse (1731), the prison (1846-52), and the Royal Bank; and here stood the German church, formerly St. Gertrude's chapel, with a spire 217 feet high, and the only peal of bells in Sweden (28 in number), cast at Hamburg in the 16th c., which was burnt down October 3, 1878. To the W. is Riddarholmen, with Riddarholm Church (founded 1278-85, rebuilt 1568-76, and nearly destroyed by lightning in 1835, but restored in 1847), 187 feet long, with a spire 295 feet high, and eight chapels, since 1807 the Swedish Westminster Abbey, containing 6000 flags and trophies taken in the wars of Sweden; Svea Hofrätt, the residence of the royal family from 1697 to 1754; Birger Jarl's statue (1854), and the Riksdagshus, where the lower house of the Riksdag met from 1834 to 1866, and both houses now meet. From Stadsholmen, the granite Norrbro (1797), the finest bridge in S., 808 feet long, with the Stromparterre, a favourite promenade, on its E. side, leads over Helgeandsholmen, the third islet of the town proper, to Norrmalm ('north suburb'), the largest and finest division of S., entered from Gustaf Adolf's Square, between the Grand Theatre-Royal (seated for 1500) and Prince Oscar's Palace. In Norrmalm are St. Jakob's Church (1588-1643), the King's Garden, with statues of Karl XII. and of Karl XIII. and the Molin Fountain (1873), Berzelius' Park, with a statue of Jacob Berzelius (1858), the Jewish Synagogue (1870), the Dramatic Theatre (700 seats), the Academy of Art, the Clara Church (1572-75, burnt 1751, rebuilt 1753), the Central Railway Station (513 feet long), the Catholic Chapel of St. Eugenias, the Technical School (erected 1868, and having, in 1874-75, 2523 pupils), the Baptist and Methodist chapels, the Public Orphanage (4000 children), the English Episcopal Church (1866), Adolf Fredrik's Church (1768), the Academy of Science, with the Royal Museum (1820), the richest collection of Arctic objects in the world, a library of 35,000 vols., and an Observatory; and the Technological Institute (1863) and School of Mines (1869), with a library of 20,000 vols. To the E. of Norrmalm is Ladugardslandet, with the Ladugardsland Church (1658-1737), the New Royal Library, the horse and life guards' barracks, and the artillery barracks; to the S.E., Blasiholmen, with Blasiiholm Church (completed 1867), the New Theatre (1510 seats), the Grand Hotel (300 rooms), the largest in Sweden, and the National Museum, erected (1850-65) after designs by Stuler, 254 feet long, 166 broad, and 88 high, comprising a historical museum and cabinet of coins, collections of majolica and other porcelain, old armour and clothing, ancient vases and bronzes, antique and modern sculpture, Egyptian antiquities, 70,000 engravings, and a mediocre picture-gallery of 1350 works (250 Italian, 451 Dutch and Flemish, 108 Swedish). To the S.E., connected by an iron bridge 536 feet long, is Skeppsholmen, a station for part of the Swedish fleet, with Karl Johan's Church (1826-42); and further S.E. is Kastellholmen. To the S.W. of Norrmalm is Kungsholmen, where are the Mint, the Serafimer Lazaret (1752, with 300 beds), the Karolinska Institut (1811), the chief medical school in Sweden, the Kurhus (1816, 200 beds), the maternity, children's, and garrison (1834, 430 beds) hospitals, and hospitals for incurables and for the insane. In Södermalm ('south suburb'), south of the town proper, are the great iron warehouse and docks, the Maria Magdalena Church (founded 1586, extended 1658 and 1673, restored after the fire of 1759), the Katarina Church, the finest in S. (built 1656-70, burnt 1723, restored 1724), and the Southern Theatre (550 seats). S. is the chief manufacturing and trading town of Sweden, its manufactures being cloth, cottons, linen, silk, glass, stoneware, tobacco, sugar, leather, soap, lucifer matches, and machinery. Ironfounding, brewing, and tile-making are also carried on. In 1872 there were 327 manufactories (38 of tobacco), with 8000 workmen, producing goods worth £2,812,500. The customs in 1873 amounted to £1,030,462.

S. has a large and excellent harbour, deep enough for ships of war. In 1874 there entered 1755 ships (535 Swedish) of 466,725 tons, and cleared 1508 (488 Swedish) of 487,580 tons. In 1877, 211 vessels (148 steamers) of 43,540 tons belonged to S. Iron and wood are the chief exports. E. of Skeppsholmen is the Djurgarden, a beautiful park, the favourite resort of the citizens, with Rosendal, Karl XIV.'s summer palace, Manilla, an institute for deaf mutes and the blind, Bellman's statue, and his colossal bust (1829); and near S. are the castles of Karlberg (from 1792 a military school), Haga (1786), Ulriksdal, and Drottningholm. S. was founded and fortified by Birger Jarl, who gave the town its earliest privileges in 1255. During the Middle Ages it was mainly confined to Stadsholmen. It began to increase about 1635-36, when Norrmalm and Södermalm were incorporated. The famous 'S. Massacre' took place in the 'Great Square,' 8th November 1520. S. suffered much from the plague in 1484, 1565, 1580, and 1710, from cholera in 1834 and 1853, and from the great fires of 1407, 1640, 1685, 1697, 1723, and 1759. Pop. (1663) 15,000; (1763) 73,000; (1840) 84,000; (1878) 156,677. See Ferlin, *S.'s Stad* (2 vols. Stock. 1854-58); Atkinson, *Art Tour in Northern Capitals* (Lond. 1873); *S. och dess Omgifningar* (Stock. 1874).

Stock'ings and **Stock'ing-Frame.** The Old English wore coverings for the legs and feet made of cloth or leather cut to shape and sewed up. These coverings were termed *hose.* The term S. came into use in the 16th c., and was applied to continuations ('nether-stocks') of the trunk-hose or breeches ('upper-stocks') then worn. Knitted S. were not made in England before the middle of the 16th c. About that time knit silk S. were introduced from Spain, into which country the art of knitting had been carried by the Moors, who learned it from the Arabs. Queen Elizabeth encouraged the manufacture of knit S. in England, and the industry not long after received an immense impetus by the invention of a machine which dispensed with the manual labour of knitting. This machine, called the S.-F., was designed in 1589 by William Lee, a native of Woodborough, Notts, Fellow of St. John's, Cambridge, and curate of Calverton. Failing to get his S.-F. adopted in England, Lee carried it to France, where he was favourably received by Henri IV. After the death of his royal patron, however, Lee shared in the persecution to which Protestants were subjected, and died in Paris in 1610. Some of his workmen returned to Nottingham, and there established the machine stocking-trade, which has since remained one of the staples of the county. The original S.-F. has been variously improved and modified, and out of it have grown the lace and net-making machines. As in hand-knitting with skewers or needles, one continuous thread is employed in the construction of the web in the S.-F.; there is therefore neither warp nor weft as in woven cloths. The S.-F. consists of a highly complex arrangement of working-parts. There is a series of 'needles' with peculiar elastic hook-shaped heads, and thread from a bobbin being laid across them, a set of levers with plates, termed *jack-sinkers,* descend and push down the thread between each pair of needles. Another set of levers with plates, called *lead-sinkers,* are then brought down on the thread so as to form loops, which are next pushed back on the needles. Another course of loops is then formed in the same way and pushed into the open hooks at the ends of the needles; the 'beards' of the hooks are pressed down by a *presser-bar,* and over the loops thus held there the first course of loops is drawn. A third course of loops is then formed, and the second drawn over them, and by a repetition of these operations the whole web is constructed. The web so produced is flat, and has to be seamed up the back to form a stocking. See HOSIERY and KNITTING.

Stock'mar, Christian Friedrich, Freiherr von, a celebrated diplomatist, was born at Koburg, 22d August 1787. He studied medicine, and practised first in his native city, and then for two years in the army. In 1816 he was appointed physician to Prince Leopold of Koburg, to whom he subsequently became private secretary. His tact, sagacity, elevation of character, and knowledge of affairs procured him the confidence of the prince, and led to his taking a prominent part in European diplomacy. Among the many delicate negotiations with which he was intimately concerned were the accession of Leopold to the Belgian throne (1831), the marriage of Prince Ferdinand of Koburg with Queen Maria II. of Portugal (1836), and the marriage of the Prussian Crown Prince with the Princess Victoria of England (1858). He was the beloved friend and trusted counsellor of Prince Albert and Queen Victoria, and in Theodore Martin's *Life of the late Prince Consort* (vol. i. 1874, vol. ii. 1876) may be traced the rare qualities of head and heart which gained him alike power and popularity. Ennobled in 1821, he was made Freiherr of Bavaria in 1831. He died at Koburg, 9th July 1863. His *Denkwürdigkeiten aus den Papieren des Freiherrn von S.,* edited by his son (Brunsw. 1872), appeared in English under the title of *Notabilia from the Papers of Baron S.* (2 vols. Lond. 1872).

Stock'port, a cotton town of Cheshire, 5¾ miles S.E. of Manchester, is built on the slopes of a narrow gorge where the Thame and Goyt unite to form the Mersey. Eleven bridges connect its numerous suburbs; and right across the valley, over the houses, the 30-arched viaduct (1840) is thrown of the London and North-Western Railway, 111 feet high and 1876 feet long. St. Mary's, the mother church of thirteen others, was rebuilt (1817) in Perpendicular style, all but a 14th c. Decorated chancel (restored 1848); and of twenty-three non-established places of worship the chief are St. Joseph's Catholic Church (1862) and a Congregational chapel (1866), with a spire 126 feet high. The public buildings include a market hall (1851-60); Mechanics' Institute (1862); the Bank of S., an ornate Italian edifice (1868); a Free Library, which in the year ending September 1877 issued 73,166 vols.; the infirmary and dispensary (1832); and a grammar-school (founded 1482; rebuilt in Collegiate Gothic style 1831), which in December 1878 had 6 masters and 148 boys. The beautiful Vernon Park, with its seven terraces, was opened in 1858, and contains a museum (1860). According to the Census Returns (1871), the employment of adults in S. district is thus distributed:—cotton manufacture 14,950, hat-making 2400, silk manufacture 872, cotton and calico printing 433, engine and machine making 494, spindle-making 109, coal-mining 530, and iron-mining 498. S. returns two members to Parliament, and publishes two weekly newspapers. Pop. of borough (1851) 53,835; (1871) 53,014. S. was the site of a Roman station, and of an old English and Norman castle, which, held by the Earls of Chester till 1327, was taken by Prince Rupert (1644), and shortly after demolished by the Parliament. After Derby, S. was the first place where silk-mills were established on the Italian principle, but to cotton it chiefly owed its growth during the second half of last century, a growth severely checked by the trade outrages against machinery (1810-20), the strike of 1828-29 when troops were called out and many persons wounded, the 'Plug Riots' (1840), and the Cotton Famine (1861-64). See Heginbotham's *S., Ancient and Modern* (parts i.-ii. Lond. 1877-78), and vol. i. of J. P. Earwaker's *East Cheshire* (1877).

Stock'ton, a river-port of England, in the county of Durham, 11 miles E.N.E. of Darlington by rail, stands on the left bank of the Tees, 4 miles above its mouth. Its six Anglican churches include St. Thomas's (1712; restored 1859), with a tower 80 feet high, St. James's (1868), in French First Pointed style, with a spire of 130 feet, and St. John's (1872), a brick edifice of the basilica type; and of numerous non-established places of worship the finest are the Roman Catholic St. Mary's (1842-70), designed by the elder Pugin in Early English style, and the United Presbyterian St. Andrew's (1861). Other buildings are the town-hall and assembly-rooms (1735), the borough hall (1852), exchange (1874), post-office (1878), free-masons' hall (1872), surgical hospital (1875), holding 120 beds, &c., and a cattle-market was constructed (1876) at a cost of £17,500. The S. and Darlington Line, the earliest in the kingdom, celebrated its fiftieth anniversary in 1875, and S. is now an important railway centre. Its harbour, also, improved by a cutting below the town (1808), carries on an extensive trade, being entered (1877) by 565 vessels of 74,146 tons, and cleared by 217 of 41,149 tons. The imports amounted to £354,523, the customs to £52,214, and the exports to £3519; and on December 31st of the same year 26 ships of 3727 tons were registered as belonging to S. In 1871, according to the Census Returns, the iron-manufacture employed 7260 adults, engine and machine making 1579, coal-mining 98?, shipbuilding 822, the earthenware manufacture 292, and brickmaking 238, and since that

date the shipbuilding industry has steadily increased, 12 British vessels of 8506 tons having been turned off the stocks in 1873, and 19 (15 steamers) of 17,063 tons in 1877. S. publishes one weekly newspaper. Pop. (1831) 7763; (1871) 28,021. A former residence of the Bishop of Durham, S. was taken by the Scots in 1645, and seven years later its castle was demolished by the Parliament.—**South S.**, in the North Riding of Yorkshire, stands on the opposite bank of the river, which is spanned by a five-arch bridge (1770), and is also a busy place, with a pop. (1871) of 6967. The two towns together form one parliamentary borough, which returns one member to Parliament, and has a pop. of 37,467; but South S. is governed by a Local Board.

Stock'ton, a town of the State of California, U.S., on the main line of the Central Pacific Railway, 100 miles E. of San Francisco, at the head of a navigable channel of the same name, which connects it with the San Joaquin river, and affords access for ships of 150 tons burden, and steamers of 500 tons. It was formerly a great emporium and place of despatch for several gold-mining regions, and is at present the chief inland wheat-market in California. It has 14 churches, 2 newspapers, 5 artesian wells, warehouses capable of storing 3,000,000 bushels of grain, large flour-mills, and manufactures of farm implements, hardware, carriages, &c. Pop. (1870) 10,066.

Sto'ics. The name applied to a body of philosophers who flourished first in Greece about the 4th c., but whose influence finally spread over the whole classical world. Their place in the history of philosophy is immediately after Plato and Aristotle. These two mighty geniuses had in turn made the two greatest efforts that have ever been made to give finality to philosophy, by putting forth a reasoned theory of the universe. Later thinkers began to seek rather for a practical system by which to live than to again attempt to solve the secret of existence. Hence Stoicism is a code of practical rules as much as a reasoned theory: still, as it was the former in a philosophical manner, it necessarily had the latter. The leading thought of the S. may be thus stated. They divided philosophy into three parts—Logic, Physics, and Ethics. 'Logic supplies the method for attaining to true knowledge; Physics teach the nature and order of the universe; and Ethics draw thence the inferences for practical life.' The only means we have of knowing about a thing is by the impression it makes on us: but we have many impressions which are certainly false: how are we to discriminate between the false and true? The S. answered this by asserting that a true impression would come home to us by a sort of 'striking evidence.' The irresistible force of truth would influence our minds in a way that false impressions were utterly unable to do. Being true, they would force us to believe they were true. In their physics (which were really metaphysics) the S. enunciated a theory of pantheism. 'The world is produced, animated, ruled by God; it is a prodigious living thing (*zôon*), the rational soul of which is God.' It follows, then, that all is wisely willed, that evil is only apparent, and that for man (here we pass into ethics) the highest good is to live in accordance with the perfect life of the universe. (Here we have the celebrated stoic maxim, 'Follow Nature.') But if this be so, pleasure, which is a merely individual thing, cannot enter into a true theory of life. It is hostile, or at least indifferent, to virtue, for that is the fashioning of the life of the individual after the universal. Material goods are of no importance to the individual save in so far as they aid him in the pursuit of virtue. They have no absolute value, nor have any external things; though some, through the chance assistance they may give to virtue, are preferable to others. Since virtue is the life in accordance with nature, the least departure from it destroys its absolute nature. 'He only is good who is perfectly good; vicious is every one who is irrational or wrong in any one point.' Virtue is absolute justice—absolute perception of the good and true, and its exact reproduction in the individual life. That is the duty of a man to himself, and he must help other men to fulfil theirs. He must help them equally, and fully also, for the 'entire race ought to form a single community with the same principles and laws.' The ideal of virtue is painted in the stoic picture of the 'Wise Man.' Living absolutely in accord with the centre principle of the universe, he possesses all knowledge and all aptitudes. He alone is the true statesman, king, educator, critic, and physician. In social life none but he can be a true friend. Absolutely independent of earthly things, he leads a life undisturbed by their ceaseless mutations. His life partakes in its essence of the life of the universe, and as such it cannot be disturbed.

The founder of stoicism was Zeno (340–260 B.C.), who opened his school in the 'many-coloured portico' (*Stôa poecile*); hence the name of the sect. After him came Cleanthes, surnamed the Ass from his stubborn patience. Then Chrysippus (of Soli, in Cilicia, died about 208 B.C.), of whom it was said, 'If Chrysippus were not, the Stoa were not,' so much was he the centre figure of the school. He wrote, it is said, 705 different works, and to him is due the regular exposition of stoicism as a system of philosophy. After him we have a new period. When Greece was brought under subjection to Rome, her systems of philosophy became known to her conquerors, and no system had more adherents than stoicism. Panaetius and Posidonius, later rulers of the Porch, were friends of the younger Scipio, Cicero, and Pompey. There was something in the stern practical character of stoicism that agreed well with the Roman mind. And how powerful its effect was we see from the great Roman writers. It is essentially the philosophy of Cicero; its influence is felt in Tacitus, and many references in Horace, Juvenal, and Persius as to the external and internal characteristics of the school show its place in the Roman world. Among its later adherents were Seneca, the tutor and victim of Nero; the slave Epictetus—'the lame old man,' as he called himself—whose writings show so remarkable an approximation to Christianity; and Marcus Aurelius, the Roman emperor. Its influence was felt in the composition of the Roman Law, which, originally a narrow code, became under the empire the greatest, the most systematic, and in many respects the wisest system of jurisprudence the world has ever seen. Specially stoical, though not stoical alone, was the conception of the Law of Nature, 'which Nature teaches all animals,' and which in its vast applications as an underlying principle had so much influence on all further legal modifications. Although stoicism as a system fell to pieces with the ancient world, it essentially reappeared in the ascetic forms of Christianity and other religions. But the reason is, not that they were descended from stoicism, but that both came from a common source. Stoicism has its origin in human nature. It is not all truth, but truth is many-sided, and this system is at least one aspect of it. The best work on the S. is Zeller's '*S. and Epicureans*' (Eng. trans. by Reichel, Lond. 1870), forming chap. 3d of his *Philosophie der Griechen*; see also F. Ravisson, *Essai sur le Stoïcisme* (Paris 1856), P. Montée, *Le Stoïcisme à Rome* (Paris 1865), and the preliminary dissertations to Grant's *Ethics of Aristotle* (3d ed. Lond. 1874).

Stokes, George Gabriel, F.R.S., was born at Skreen, County Sligo, August 13, 1819. In 1837 he entered Pembroke College, Cambridge, graduated as Senior Wrangler and First Smith's Prizeman in 1841, became a Fellow of his college the same year, and in 1849 was elected Lucasian Professor of Mathematics, a post once filled by Newton himself. Like his great predecessor, S. combines a splendid mathematical genius with a rare experimental skill, a combination which has enabled him to attack problems of the gravest difficulty in mathematical physics. Of these may be mentioned his researches into the internal friction of fluids in motion and the elasticity of solids, and a magnificent series of papers upon the undulatory theory, all in the *Cambridge Philosophical Transactions* (1845-51). His hydro-kinetic theorems formed the basis upon which Helmholtz developed the theory of vortices, which, in the hands of Sir W. Thompson, has assumed such an importance in material hypotheses. S. is best known perhaps by his explanation of Fluorescence (q. v.), contained in a paper *On the Change of the Refrangibility of Light* (*Phil. Trans.* 1852), for which he obtained the Rumford Medal from the Royal Society; but there is no doubt that he was the first to clearly enunciate (in his class lectures) the principle upon which Spectrum Analysis (q. v.) depends, and which was afterwards independently arrived at by Stewart and Kirchhoff. The value of his work, which unfortunately is scattered in numerous papers, published chiefly in the *Philosophical Transactions* and the *Cambridge Philosophical Transactions*, can hardly be overestimated; and at present he is believed to be engaged upon a systematic treatise on Sound and Light. S. has been a secretary of the Royal Society since 1854, and was president of the British Association in 1869. His *Light* (1876) contains a lucid and elementary exposition of fluorescence. A

biographical sketch by Professor Tait was published in *Nature*, vol. xii. (July 15, 1875).

Stoke-upon-Trent, the capital of the 'Potteries,' Staffordshire, stands on the Trent, 2½ miles S. of Burslem by rail. Its parish church, a Gothic structure of last century, has a tower 112 feet high, and contains the tomb of Wedgewood; other buildings are the town-hall and market-house (1834), a Tudor railway station and hotel, with statues fronting it of Wedgewood and Minton, the Hartshill Infirmary (1868), and the Harpfield Schools (1875). The enamel and porcelain works of Minton and of Copeland are widely famed, but trade has been slack during the present year, the total value of the goods exported from the Potteries in the first nine months of 1878 being £1,260,590 against £1,288,777 in the corresponding period of 1877. Other important industries are coal-mining, the iron manufactures, brickmaking, and the manufacture of engines and machines. Pop. of town (1871) 14,007; of parliamentary borough, which includes Hanley, Burslem, &c., and returns two members, 130,985.

Stol'berg, a town of Rhenish Prussia, 7 miles from Aachen, and a station on the Köln-Aachen railway. It is a centre of an important metal-ware industry. In the town and the neighbourhood are numerous brass foundries, copper mills, wire, needle, and pin factories, &c. Cloths, mirrors, and other glass wares, chemicals, &c., are also manufactured. Pop. (1875) 10,256.

Stol'berg, Christian Graf zu, a German lyric poet, belonging to one of the oldest German families, was born at Hamburg, 15th October 1748, studied at the University of Göttingen (1769-74), filled for over twenty years the post of Amtsman at Tremsbüttel, Holstein (1777-1800), lived for other twenty in retirement, and died 18th January 1821. He wrote a large number of lyric poems, several unsuccessful imitations, and some successful translations of Greek plays. He and his younger brother, **Friedrich Leopold Graf zu S.**, were both members of the celebrated literary society called the 'Göttingen Hainbund,' in which many of the best-known lyric poets of that period who took Klopstock as their model were united. Of the two the younger brother was by far the better poet. He was born in Bramstedt, 7th November 1750, was employed as minister of the bishopric of Lübeck, in Copenhagen (1777-89), and as ambassador at Berlin. In 1800 he resigned his offices, and with all his family professed at Münster his adhesion to the Roman Catholic Church. This conversion created a profound sensation in Germany. S. had already published a large number of works, which showed an earnest and passionate love of freedom both in thought and action. The tendencies of the school to which he belonged were liberal Protestant, and his most intimate friends were bitter opponents of Catholicism. S.'s last days were embittered by the controversies to which his conversion gave rise. He died at Sondermühlen, near Osnabrück, 15th December 1819. S. wrote a large number of works, of which the chief are a romance entitled *Die Insel* (1788); *Reise durch Deutschland, die Schweiz, Italien, und Sicilien* (1794); translations of Homer, Æschylus, and Ossian; *Leben Alfred's des Grossen* (1815); *Geschichte der Religion Jesu Christi* (1811-18). The historical works all belong to the period after his conversion, and as they are written in accord with the spirit of Roman Catholicism, they are wanting in independent historical value. His poems exhibit a wide range of sentiment and thought, from the expression in simple language of simple feeling, to wild utterances on freedom and friendship. The *Werke der Brüder S.* were published at Hamburg in 22 vols. 1821-26. See Nicolovius, *Friedr. Leop. Graf zu S.* (Mainz. 1846); Menge, *Der Graf Friedr. Leop. von S. und seine Zeitgenossen* (2 vols. Gotha, 1862).

Stole (Gr. *stolē*, 'a robe'), among the ancient Romans, was properly the robe of women, as the *toga* was of men. Some of the luxurious emperors having added to their togas the embroidery which bordered the S., the latter garment became common to both sexes. Then as this border was the most valuable part of the S., the robe itself seems to have gradually fallen into disuse, and the border to have been kept as an ornament, which assumed its present form of a long narrow scarf, and came to be regarded as belonging exclusively to the clergy. As early as the 4th c. the use of the S. was forbidden to any under the rank of deacons, and these even could only wear it when celebrating the holy mysteries, while priests wore it constantly as a mark of sacerdotal dignity. Besides, while priests wore it round the neck, with both ends in front, deacons had to wear it over the left shoulder, with the ends fastened under the right arm (in the Eastern Church with one end before and the other behind).

Stolen Goods, by English law, if purchased *bona fide* in market overt, may be retained by the purchaser unless the owner have duly prosecuted and convicted the thief; if, however, they have not been exposed for sale in market overt, but have been bought privately, the purchaser is bound to restore them to the true owner. By Scottish law, on the other hand, the true owner may raise an action not only against the thief, but against any person or persons who have purchased the goods irrespective of *bona fide*.

Stol'pe, a town of Prussia, province of Pommern, on the river S., 15 miles from its mouth, and 75 W. by N. of Danzig by rail. It has a garrisoned castle, a large Marienkirche (1311), with a tower 190 feet high, an hospital, &c., and manufactures amber, brandy, beer, linen, and cordage. Pop. (1875) 18,356. The port of S., Stolpemünde, has a pop. of 1830, and possesses 31 vessels of 3879 tons.

Stom'ach, the dilated portion of the alimentary canal, in which the food is detained for a longer or shorter period to admit of its being mixed with the *gastric juice*. A stomach may be entirely wanting in some animals; *e.g.*, Protozoa (q. v.), tape-worms, &c., and in *Cœlenterate* animals, represented by such forms as the jelly-fishes, sea anemones, corals, &c. The S. is of very imperfect structure, and in its most typical development exists as a sac which opens freely below, and communicates with the body-cavity. In man's own class (*Mammalia*), the S. may exhibit certain important complications, which reach their maximum in the ruminants, where the S. is divided into four compartments; the whole S. of a ruminant, however, corresponding to the human S. Man's S. is a simple pear-shaped organ, situated in the epigastric and right and left hypochondriac regions. The base of the pear or cone lies towards the left site, the smaller extremity of the S. lying to the right side, and being continued to form the *small intestine*. Below the S. the *transverse colon* is situated. Above, the S. is in close relation to the *Diaphragm* (q. v.) or midriff, and also the front wall of the abdomen. The weight of the S. is about 4½ ounces. The transverse diameter of the S. when full is about 12 inches, and its vertical diameter 4 inches. The larger (left) extremity is the fundus. The gullet opens into this extremity by the *cardiac* opening. The opposite or intestinal aperture of the S. is named the *pyloric aperture*, this latter opening being guarded by a circular fold of the mucous or lining membrane of the S., which serves as a valve to prevent the escape of the food before the proper moment arrives. The *lesser curvature* of the S. is its upper border, the *greater curvature* forming its lower margin. The structure of the S. shows it to consist of four coats. Externally is the *serous* coat; then comes the *muscular coat*, composed of unstriped muscular fibres: a *cellular coat* lies below the muscular covering; and the inner or *mucous coat* forms its lining membrane, and comes in contact with the food. This mucous coat is thickest at the pyloric extremity of the S., and exhibits *rugæ* or folds when the S. is empty. These folds disappear when the cavity is distended with food. In the mucous coat are the *gastric glands*, which secrete the *gastric juice*. These glands are tubular prolongations of the mucous coat lined by *epithelial cells*. They may be simple tubes, or may exhibit a branching arrangement. The glands attain a length of the $\frac{1}{25}$ of an inch and a diameter of $\frac{1}{35}$ of an inch. Other (*lenticular*) glands occur in the S., but have no openings, and are most numerous in early life. The S. derives its blood from the *hepatic* and *splenic arteries*, and its nerves from the *pneumogastric trunks*. The *gastric juice* of the S. consists of water (994·40) and solids (5·59). The solids include *pepsin*, *hydrochloric acid*, *chloride of lime*, *potass*, *sodium*, and *phosphates*.

Diseases of the S.—The various morbid conditions of the S. may depend on functional disorders, lesions of texture, or both combined. The morbid states of the S. are (1) softening of tissue; (2) glandular degeneration of the proper mucous substance; (3) congestion; (4) forms of inflammation tending to exudations and destruction of parts, or condensations of tissue about the pyloric orifice; (5) ulceration; and (6) carcinoma.

Softening of the S.—According to Dr. Handfield Jones 'there are two forms of softening: one, the commonest by far, which is simply the result of the action of the acid contents of the S. upon its own dead tissue; the other, the consequence of a peculiar change taking place in its glandular structure, which generates a powerful acid, dissolving, corroding, or destroying the surrounding tissue. The latter form may occur either with an empty or a full state of the blood-vessels of the S., the softening part of which will accordingly be either quite pale or of a dark blackish tint. This same form occurs in a great variety of morbid states, which seem to have only this in common, that they are attended with great depression of the vital powers. It is more common in children than in adults, on account of the greater delicacy and less resisting power of the system.' Softening of the S. most frequently occurs in connection with such diseases as enteric fever, peritonitis, cancer of the uterus, tubercular hydrocephalus, ulceration of the S., and inflammatory diseases of the brain. The symptoms in connection with such diseases are pain, tenderness at the epigastrium, thirst, nausea, vomiting of acid fluids, and loss of appetite. *Glandular degeneration of the mucous substance* is a much more common lesion. In such cases there may be complete destruction of the tubular glands without replacement of tissue, or there may be a replacement of tissue by the deposition of granular matter within the tubes without diminution or alteration of form. The general symptoms of such conditions are anæmia and debility, without any obvious organic cause, loss of appetite, nausea, and vomiting, a peculiar feeling of weight in the S. and an abundant generation of gas.

Congestion of the S. may be passive or active. *Passive* congestion may depend upon any mechanical impediment preventing the blood returning from the S. towards the heart, such as an obstruction in the liver. The immediate effects of congestion may be hæmatemesis, or the vomiting of blood, or a marked decrease in the secretion of the gastric juice. In the latter case the digestive powers of the S. are impaired, and the persistence of the congestion leads to organic changes and the formation of ulcers. There is also a form of congestion called *vicarious*, which sometimes occurs in women from the stoppage of the catamenia, and which also occurs in cases of yellow fever, cholera, and enteric fever.

Idiopathic Gastritis is an exceedingly rare disease, and when inflammation does occur it is generally due to direct injury, the most frequent form being that induced by excess of eating or drinking, especially of alcoholic drinks.

Ulceration of the S. is not an uncommon lesion, the forms usually described being simple, chronic, and perforating. The ulcer is general, solitary, and deep, with well-defined edges, as if it were punched out, and about the size of a shilling, its site being generally near the lesser curvature, on the posterior wall, and towards the pyloric orifice. It most frequently occurs among women in middle or advanced life, and is especially found in maid-servants between the ages of eighteen and twenty-five. According to Dr. Brinton, about 13·4 per cent. of cases of ulceration terminate by perforation, and in such cases death may result from the first shock, or the patient may succumb to peritonitis and gastric exhaustion. The symptoms of gastric ulcer are disturbance of digestion, uneasiness and pain, nausea and vomiting, the food being expelled, and along with it a tasteless or acid watery secretion. Retaining the liabilities to death by perforation, by hæmorrhage, by vomiting, and by exhaustion, the lesion often ends by one of these modes of dying, or by two or more of them in combination. In other cases, a spontaneous subsidence of these symptoms, in something like the inverse order of their occurrence, announces a recovery; or a similar amendment is only effected by a careful medical treatment, such as quite entitles us to dignify it by the name of a cure.

Cancer of the S. is of much less frequent occurrence than ulceration. Of necropsies, performed at four of the great London hospitals, only about 1 per cent. of the total mortality is due to this disease, and it has been found that males are more frequently affected than females, cancer amongst females most frequently appearing in the breasts and the uterus. The orifices of the S. are the parts most frequently affected. The symptoms of cancer, in the first stage, are very similar to those of ulceration, but the complexion acquires a muddy, yellowish, or faint greenish hue, and these are the usual symptoms of the cancerous cachexia. At the later stage, a tumour often becomes perceptible near the middle of the epigastric region, which may be regarded, in conjunction with the cachexia, as symptomatic of the disease. The termination of cancer of the S. is debility, emaciation, prostration, delirium, and death. In the treatment of cancer of the S. nothing can be done except to support the strength by the administration of easily-digested food, as in cases of indigestion, and by the administration of opiates to alleviate pain. The treatment of the different forms of diseases of the S. has been described in special articles, such as INDIGESTION, ENTERITIS, GASTRALGIA, HÆMATEMESIS, and SARCINA VENTRICULI.

Stomap'oda (Gr. 'mouth-footed'), an order of the class *Crustacea*, belonging to the *Podophthalmate* or 'stalk-eyed' divisions of the class, and including the *Squilla*, or Locust Shrimp, the Opossum Shrimp (*Mysis*), &c. These shrimps are not to be confounded with the common shrimps, which belong to the order *Decapoda* (q. v.). In S. the legs number from 6 to 8 pairs, and the gills are borne either beneath the chest or on the abdominal segments. The shell is usually thin and membranous, and the foot-jaws are well developed. The tail-fin is broad and powerful.

Sto'mata (Gr. 'mouths') are minute openings existing between the cells of the air-exposed epidermis of plants. They are oval or mouth-shaped, bordered by *lips* or *guard-cells*, formed of two or more elastic cells, so disposed as to cause the S. to open in a moist and to close up in a dry state of the atmosphere. These guard-cells contain chlorophyle. S. communicate with intercellular cavities, and are obviously designed to regulate evaporation and respiration. They are found in all the higher plants from the *Hepaticæ* upwards, usually occurring in the green parts, more rarely in the coloured petals, and in fruits and seeds. Both surfaces of the leaf in Monocotyledons are provided with S., while in Dicotyledons they are generally almost or altogether absent from the upper surface.

Stone. See CALCULUS and LITHOTOMY.

Stone (in building). See BUILDING STONES.

Stone, the name of a British weight, equal usually to 14 lbs. avoirdupois. A S. of wool, however, contains 24 lbs., and a S. of butcher-meat only 8. The same weight is used throughout Germany, Sweden, and Holland, for such goods as wool, flax, hemp, feathers, &c.; but its value varies greatly with locality.

Stone, a market-town of Staffordshire, on the Trent, 7 miles S. of Stoke-upon-Trent by rail. It has two churches, St. Michael's (1750) and Christ Church (1840), a Congregational chapel (1871), two convents, with 126 and 48 inmates respectively in 1871, a town-hall (1869), market-hall (1868), and a free school founded in 1558. The earthenware manufacture in 1871 employed 1328 adults in S. and its vicinity, and shoemaking 908 more, while other industries are malting, brewing, tanning, and brick-making. Pop. (1871) 3732.

Stone, Artifi'cial. Most varieties of A. S. [(using the term in a restricted sense, excluding Brick (q. v.) and Terra-Cotta (q. v.)] have a base of hydraulic mortar, with which sand and pulverised stone of different kinds are mixed. Some years ago Mr. Ransome of Ipswich introduced a kind of A. S. in which silicious instead of calcareous matter was employed as the cementing material. The process at present followed in the manufacture of this A. S. consists in carefully mixing well-dried sand and dust of chalk with silicate of soda, obtained by digesting flints under pressure in a boiling solution of caustic soda. After moulding, the blocks are exposed to the action *in vacuo* of chloride of calcium in a solution, where, by chemical reaction, the block is transformed into a silicate of lime, a body of unusual strength and durability. The other compound formed is chloride of sodium, or common salt, and is removed with water. The A. S. of Sorel, a French chemist, is made by mixing a cement formed of the basic oxychloride of magnesium with sand, chalk, or powdered marble. The cement, which may be moulded of itself into a hard stone, is procured by acting on protoxide of magnesium (calcined and ground carbonate of magnesia or magnesite) with a concentrated solution of chloride of magnesium. Sorel's process has been widely adopted in the United States, where calcareous and silicious A. S. is also abundantly manufactured.

The applications of A. S. are very numerous; building-blocks, flag-stones, tiles, statuary, vases, architectural ornaments, grind-stones, sewer-pipes, are but a few of them; and in the break-waters of Dover, Cherbourg, Port Said, and Cape Henlopen at the mouth of the Delaware, we have examples of its suitableness for marine constructions.

Stone, Preservation of. Many processes have been devised for preventing the destruction of buildings and monuments by atmospheric influences, but as yet the results have not been entirely satisfactory. Fatty and oleaginous substances for filling the pores of the stone are efficacious only when renewed from time to time. Several inventors have employed *mineral* solutions with fair success. Kuhlmann chose an aqueous solution of silicate of potash (water-glass), and applied it to the Louvre and the cathedral of Notre Dame in Paris. In the moist climate of England, however, water-glass yields uncertain results, an unsightly efflorescence appearing on the surface of the stone. Fluosilicic acid washed with an alkaline solution, alumina soap, a silicate coated with asphaltum varnish, fuller's earth in diluted hydrofluoric acid, and an alkaline silicate washed with chloride of calcium solution, have all been suggested. The last-mentioned process, Ransome's patent, has so far received most favour. The silicate is brushed over the stone, and when it has dried the other solution is applied; double decomposition takes place, and an insoluble silicate of lime is precipitated in the pores of the stone, filling them up and thereby cementing together the particles of the stone.

Stone Age. See BRONZE AGE.

Stone-Chat (*Saxicola rubicola*), a species of *dentirostral insessores* allied to the robin, and attaining a length of 4 or 5 inches. It is black above and white tinted with light brown below, the breast being chestnut-brown. This bird has a harsh, chattering voice, hence its name. It is usually found near furze-thickets. The eggs number from four to six, and are of a pale blue colour spotted with reddish brown at one extremity.

Stone'-Crop. See SEDUM.

Stone' Cutting and Dress'ing Machines. Considerable progress has been made in the application of machinery to the shaping of stone. Marble and slate are cut into slabs by sawing-machines of different forms, having usually a reciprocating motion and iron blades like the ordinary hand stone-saw. For cutting the slabs of marble into strips, a machine, consisting of a gang of circular iron discs mounted on a horizontal spindle, which is rotated by a band and pulley, is in general use. The slab is mounted on a travelling carriage which presses the stone against the discs, while sand and water are profusely applied to the kerbs or slits so made. Mouldings are imparted to edges of marble strips intended for mantel-pieces and other objects, by means of a solid iron cutter, having a converse form to that of the moulding to be produced. The cutter revolves rapidly on a vertical axle, and the marble, resting on the bed of the machine, is brought up against it, and carried onward as fast as the moulding is produced. Marble is also cut into balusters and other architectural ornaments on a lathe with steel tools, the marks of which are afterwards removed by grinding. Stone-working machines, in which boart or black diamond constitutes the cutting agent, are being widely introduced in the United States. In the diamond stone-saws every tooth is tipped with a diamond, much ingenuity being displayed in the fixing of it to a thin metal body. The circular form is chiefly adopted, the diameter being about 6 feet, and the disc revolves at a high velocity, while the slit is deluged with water. The diamond circular saw of the Everson Stone-Saw Company is reported to cut through 75 feet of ordinary sandstone per hour, and other stones at a rate inversely proportional to hardness. Machines for dressing or facing building-stones have been contrived on different principles, but they have very limited use. The action of the patent dressing machine of Mr. Holmes, of London, resembles handwork with chisel and mallet. The cutters consist of a double row of chisels fixed into a transverse holder, and have a short radial movement. The rough stone is laid on a travelling bed which has a slow action to and fro, and at each pass one set of cutters meets the stone on an angle. A few passes are sufficient to produce a smooth surface. Messrs. Brunton and Frier, Battersea Foundry, London, exhibited at the Paris Exhibition of 1878 a stone-dressing machine of novel and substantial design. The stone to be operated on moves along a bed, by the side of which is mounted a vertical rotating chuck, nearly eight feet in diameter. On the circumference of this chuck are mounted a series of steel cutters, carried on obliquely radiating spindles, and to which absolute rotation is given from suitable gearing within the chuck. The edges of the cutters travel at a speed of 1900 feet per minute, and in the same time 24 inches of granite and 36 to 40 inches of freestone are dressed in a manner equalling handwork, the stone being thrown off in chips about 1 inch thick.

Stone-Fly (*Perla bicaudata*), a species of *Neuropterous* insects familiar to anglers, and much used as a bait in trout-fishing. The hinder wings are large, and the abdomen has two long filaments. The larger jaws or mandibles are rudimentary. The S. and its larvæ are common in ponds.

Stone-Fruits is popularly applied to those fruits in which the single 'kernel,' is enclosed in a 'stone,' and this enveloped in an edible pulpy mass covered by a thin 'skin.' We have examples in the cherry, peach, plum, olive, &c. Botanically this kind of fruit is called a *drupe*, the skin being the *epicarp*, the pulp the *mesocarp*, and the hard shell of the seed the *endocarp*.

Stoneha'ven, the chief town of Kincardineshire, in Scotland, on S. Bay, 16 miles S. by W. of Aberdeen by rail. It consists of an Old and a New Town. The former, to the S.E., on the low ground near the harbour, has a Roman Catholic chapel (opened 1878), an old Episcopal church and school, and a handsome county court. It is chiefly inhabited by fishermen. The New Town on the N. side of the Carron River has a Free church, a United Presbyterian, a new Episcopal church (1878), and a new townhall (1878). Half a mile from the town is the parish church (Dunnottar), in the churchyard of which 'Old Mortality' laboured; and 2 miles off is Dunnottar Castle, one of the most striking and famous ruins in Scotland. S. has considerable fisheries, employing about 90 boats. Near the town is Glenurie distillery. Pop. (1871) 3396.

Stone'henge (Old Eng. 'hanging stones,' or 'stones of Hengist'), the megalithic structure rising in lonely grandeur on Salisbury Plain, is distinguished from all similar circles by being the only hewn-stone monument we possess, the only one where we meet with horizontal architrave. So far as its ruined state lets us determine, its outer stone circle consisted of thirty piers, 13 feet high, connected by a continuous impost, the circle's diameter being 97·6 English or exactly 100 Roman feet. Within it stood five great trilithons, the central and highest 21·6 feet high, forming a kind of choir, across whose entrance eight stones from 3 to 6 feet high would represent the screen. Thus far the structure is wholly composed of 'sarsens,' a local class of silicious sandstones, but there are also inside the choir eleven igneous 'blue-stones,' which must have been brought from a distance (Wales, Cornwall, or most probably Ireland), and which in Mr. Fergusson's opinion are the remains of smaller trilithons. Add that an earthen vallum ran round the outer circle at a distance of 100 Roman feet, and the chief features of S. are here complete. Inigo Jones's theory (1620), that S. was 'a Roman temple, inscribed to Cœlus, and built after the Tuscan order,' was opposed by Dr. Charleton, who ascribed it to the Danes; but Dr. Stukeley (1740) overrules both their opinions, proclaiming it a Druid temple, the view adopted by Wood, Cooke, King, Davies, even Sir R. C. Hoare. Next, Maurice claimed it for the Assyrian Bel; Ellis and Duke saw in it an astronomical observatory; the modern school of palæontologists, with Lubbock at their head, assign it an antiquity of from 10,000 to 50,000 years; and the Rev. L. Gidley (1873), viewing it 'by the light of ancient history and modern observation,' ascribes it to 'Helios-Arkites,' whoever they may be. Lastly, Mr. Fergusson maintains that S. and similar structures are 'sepulchral, or connected directly or indirectly with the rites of the dead, that they are not temples, and that they were erected by partially civilised races after they had come in contact with the Romans.' He grounds his theory on the negative evidence that no allusion is made by classical writers to S., though the Romans occupied Old Sarum during their whole stay in the island, and the Via Badonica ran close by, whilst Druids are only heard of in Mona, not in Wiltshire, Cumberland, the Western Isles, or Scandinavia. Secondly, these unroofed circles, reared in the most

exposed situations, are utterly unsuited for temples, and no astronomer can say what observations could possibly have been better made by their aid. Thirdly, excavations carried out by the Duke of Buckingham (1620), and later by Cunnington and Hoare, brought to light iron armour and Roman pottery at such depths, and in such positions (*e.g.*, under the base of fallen stones), as show that the Romans must have been been in Britain before the erection of S. And fourthly, all direct historic evidence such as we have points to the same conclusion, Nennius and Geoffrey of Monmouth representing S. as raised by Ambrosius to commemorate the slaughter by Hengist of 300 nobles (462 A.D.), whilst the neighbouring structure of Avebury is actually called a burying-place (*byrgelsas*) in a charter of Æthelstan (939). See J. Fergusson's *Rude Stone Monuments* (Lond. 1872), and the works there cited.

Stone'house, the central of the 'Three Towns' forming Plymouth (q. v.), contains the Victualling Office, the Royal Marine Barracks, and the Royal Naval Hospital, and had a pop. (1871) of 14,585.

Stone'ware, the general term for a strong, dense, highly vitrified variety of earthenware. See POTTERY and PORCELAIN.

Ston'ington, a seaport of Connecticut, U.S., 50 miles S.W. of Providence by rail, and the port of transference from steamship to railroad on one of the routes between New York and Boston. It has 6 churches, 2 newspapers, &c., and annually despatches a number of whaling and sealing vessels. S. dates as a settlement from 1649. Pop. (1870) 6313.

Sto'nyhurst College is situated in the parish of Mitton, E. Lancashire, 10 miles to the N. of Blackburn. Standing on Longridge Fell, above the Hodder, its buildings, for centuries the seat of the Shireburn family, passed (1754) to the Welds of Lulworth, and by Thomas Weld were granted in 1794 to eighteen Jesuit fathers, driven from Liège by the Revolution. The college they founded has grown to be the Catholic Eton, with 22 instructors and 252 students in December 1878. The original mansion, Romanesque in style, has been largely added to during the years 1835-78; and there are now three chapels, the finest that of the Sodality (1859), besides the Perpendicular St. Peter's Church (1835) at the S.E. angle, which is open to the public. The valuable library and museum, observatory (1836), gymnasium, and covered play-room, Academy-room and theatre, the Seminary (1835), a capital cricket-ground and bathing-place, are all described in Hewitson's *S. C., its Past and Present* (2d ed. Preston 1878).

Sto'ny Point, a small rocky promontory on the W. bank of the Hudson River, U.S., opposite Verplanck's Point, 42 miles N. of New York city, at the entrance to the Highlands. A fortification of some importance in the Revolutionary War, it was captured and strengthened by the British, but was recovered in a night attack by Wayne. It is connected by a marsh with the shore, and supports a lighthouse and fog-bell tower. In the village here is the house where Benedict Arnold held his treasonable interviews.

Stool of Repen'tance was the name given to a stool on which persons undergoing Church Discipline (q. v.) had to sit during divine service in full view of the congregation. With the modern relaxation of discipline the S. of R. is now entirely disused, although in some of the remote parts of Scotland it has been so for a much shorter time than might be supposed.

Stop, in music, an instrument by which the sounds of wind instruments are regulated. The stops of an organ are a collection of pipes similar in tone and quality which run through the whole or a large part of the instrument. By means of registers the air may be admitted or excluded from each stop at pleasure. When a note is struck, all the pipes belonging to the note in those stops of which the register consists sound simultaneously. The chief organ-stops are the two diapasons; the principal, the twelfth, the fifteenth, the sesquialtera, the mixture or furniture, the trumpet, the clarion, and the cornet, but there are a great number of others. The stops taking their names from musical instruments are designed to produce imitations of these. The choir organ usually contains the diapason, the dulcimer, the principal, the twelfth, the flute, the bassoon, and the vox humana.

Stopp'age in Trans'itu. When the consignee of goods on credit becomes insolvent before delivery, but not otherwise (see GOODS, PURCHASE AND SALE OF), the consignor may, in many cases, countermand delivery and so resume possession. The exercise of this right is termed S. in T. Goods delivered to a carrier named by the vendee may be stopped by the vendor. Payment of part of the price does not affect the right, but it is barred by even partial delivery of the goods. It is also barred if the vendee has exercised any right of ownership, such as payment of storage rent, even though the warehouse of the vendor be the store paid for.

Stopp'ages of Pay, in the army and navy, small sums of money deducted from a soldier or sailor's pay for messing, washing, hospital, hair-cutting, damages to barracks, fines for drunkenness, &c.

Sto'rax, a balsamic gum-resin obtained from *Styrax officinale*, a tall bush or small tree native of countries bordering the Mediterranean. S. is obtainable both as an exudation of the plant and by pressure of the stripped bark. It was formerly much employed as a stimulating pectoral remedy, but has now almost if not quite disappeared as a commercial drug, being supplanted both for medicine and perfumery by liquid S. Besides resin and a volatile oil it contains about 2 per cent. of benzoic acid.

Stork (*Ciconia*), a genus of *Grallatorial* or Wading Birds, having a long and much-compressed bill, long wings, and tarsi, and toes united at their bases by membrane. The third and fourth quills are the longest, and the hinder toe hardly reaches the ground. The common or white S. (*C. alba*) occurs in Europe and migrates to Africa in winter. The average length is 3½ feet, and the plumage is white; the wing-quills and greater wing-coverts are black. The S. is protected especially in Holland. It builds its nest on housetops, and shows the greatest familiarity with its human surroundings. The attachment of the S. to its young is so remarkable that it has become a proverb. The Black S. (*C. nigra*) occurs in Europe, Asia, and Africa. The name Adjutant S. is given to the *Leptoptilus argala*, common in India, where it is protected by law. An allied form (*L. Marabou*) gives the famous 'Marabou feathers' of Africa. The Whale-headed S. (*Balæniceps rex*) inhabits N. Africa, and has a very large and clumsy bill, whence its name of 'Shoe-Bird.'

Storms. See WINDS.

Storn'oway, the chief town and seaport of Lewis (q.v.), the largest and most northerly of the Outer Hebrides, in the N.E. of the island, at the head of the deep inlet of Loch S., which is sheltered to the N. by a long, irregular peninsula. It has several good public buildings, and on an eminence overlooking the town stands S. Castle, a castellated Tudor edifice, the residence of Sir James Matheson, Bart., who has made great improvements in the vicinity. A Free Church (for services in English) was opened in 1878. S. is an important fishing station now possessing (1878) 661 boats, and employing 3466 fishermen resident within the limits of the port and 4500 strangers, while it has several saw, carding, and corn mills, a large distillery, &c., and is the seat of an important cattle fair held on the second Wednesday in July. Two steamers ply regularly between S. and Glasgow, and there is a bi-weekly mail-packet *via* Poolewe to Dingwall. Pop. (1871) 2535.

Stor'thing. See NORWAY.

Sto'ry, Joseph, LL.D., born at Marblehead, Massachusetts, 8th September 1779, graduated at Harvard College in 1798, began to practise law at Salem in 1801, and as member of the State Legislature (1805-8) was the acknowledged Republican leader. Returned to Congress in 1808, he urged the repeal of the embargo on foreign commerce, and declining re-election in 1810, was again chosen a member and elected Speaker of the State Legislature. He was appointed associate justice of the Supreme Court of the United States (1811), a member of the convention for the revision of the State constitution (1820), and Dane professor of law in Harvard University. He died 10th September 1845. A voluminous writer on legal and constitutional subjects, his *Commentaries* have passed through several editions. His written decisions comprise twenty-seven volumes, and his judgments in the Supreme Court thirty-four volumes. They are regarded with the greatest respect both in

America and England. His *Life and Letters*, by his son W. W. Story, appeared in 1851, and a collected edition of his *Miscellaneous Works* in 1852.—**William Westmore S.**, son of the preceding, born 19th February 1819, is the author of several legal works, but is better known as a sculptor. He has resided for some thirty years in Rome, and among his best-known works are his 'Medea,' 'Cleopatra,' and 'African Sibyl;' his statues of George Peabody for the London Corporation, and Edward Everett for Boston; and his busts of his father, of J. R. Lowell, Josiah Quincy, and Theodore Parker. His sculpture is distinguished rather by grace and beauty of finish than by strength or originality. He is the author of *Roba di Roma* (1862), *Proportions of the Human Figure* (1866), *Graffiti d'Italia* (1869), *A Roman Lawyer in Jerusalem* (1870), and several volumes of verse.

Stoth'ard, Thomas, an English artist, was born 17th August 1755, at the Black Horse, a public-house kept by his father in Long Acre, London. On his father's death he was apprenticed to a pattern-draughtsman in Spitalfields, but before his term was expired some of his drawings had struck the fancy of the proprietor of the *Novelist's Magazine*, and on his master's death he found more congenial employment in book illustration. His first efforts appeared in an edition of *Ossian*, and in Bell's *British Poets;* and he afterwards illustrated *Peregrine Pickle* (1781), *Clarissa* and *Sir Charles Grandison*, *The Pilgrim's Progress* (1788), *Robinson Crusoe* (1790), and *The Rape of the Lock* (1798). In 1778 he appeared with his oil-painting of 'The Holy Family' in the exhibition of the Royal Academy; and he continued to exhibit till 1824, when he contributed 'Venus attended by the Graces.' Although he never attained the same success in oil as in Indian ink, some of his paintings became popular, *e.g.* 'The Canterbury Pilgrims' and the 'Dunmow Flitch;' and he was employed to adorn the staircase of Burleigh House and the ceiling of the Advocates' Library at Edinburgh. Turner greatly admired him, and called him the Giotto of England. A typical idealist, he joined to intense mental purity a love of physical smoothness, the secret of his success in expressing tender pathos or graceful gaiety. He became a member of the Royal Academy in 1794, and in 1814 he succeeded Burch as librarian. He died 27th April 1834.—**Charles Alfred S.**, son of the preceding, was born 5th July 1787, published *Monumental Effigies* (1811–18; completed 1823), assisted Lysons in his *Magna Britannia*, and was appointed historical draughtsman to the Society of Antiquaries. He was killed by a fall while engaged in tracing a stained-glass window of the church of Bere Ferrers, 28th May 1821. See *Life of Charles S.* (1823), and *Life of Thomas S.* (1854), both by Charles's widow, better known as Mrs. Bray.

Stour'bridge, a market-town of Worcestershire, on the Stour, 5 miles S.S.W. of Dudley by rail. It has two churches, St. Thomas's (1742) and St. John's, designed by Street, in First Pointed Style (1860), a Second Pointed Catholic church by Pugin (1864), a convent (1868), a corn exchange (1854), mechanics' institute, county court (1864), and a grammar school (founded in 1553 and rebuilt in 1862). In 1871 the manufacture of nails engaged 3490 adults in S. and its vicinity, that of iron 2902, of glass 1006, of chains 658, of fire-bricks 501, of machines 333, and of guns 61, whilst coal-mining employed 981 more. 'S. clay' for making fire-bricks is an article of export. S. publishes one weekly newspaper. Pop. (1871) 9376; (1878) over 10,000.

Stoves, apparatus for retaining and slowly diffusing heat, are in common use in most countries where fuel is scarce. The old S. were faced with plain porcelain or highly ornamented tiles. The first iron S. was designed by Cardinal Polignac in the 18th c. Count Rumford (q. v.) devised several improvements with the view of economising fuel and heat. In America the stove has undergone immense modifications, the later inventions referring chiefly to self-feeding, base-burning, and hot-air feeding. Gas, petroleum, and soapstone S. are widely used, but excluding these there were 2,686,000 S. (value $47,040,000) produced in the United States by 200 foundries, employing 28,000 men, in 1876.

S. for botanical and horticultural purposes are of various kinds, but may be reduced to the dry-stove, the damp-stove, and the intermediate or bark-stove, respectively used for succulent plants, for orchidaceous plants and ferns, and for tropical trees and shrubs, together with the pine-stove used for fruiting pine-apples. The dry-stove requires abundance of light, with power of heating to 60° in winter; the damp-stove should have heating power up to 80° above the external winter temperature, and a power of saturating the atmosphere with moisture at all seasons; the ordinary botanic or bark-stove requires a like degree of heating power, but more space and light; and for the pine-stove—which is a low structure with bark or other beds in which the pots are plunged—the heating power should be equal to 70° during winter.

Stow and **Stoc**, two Old-English words meaning a place, and entering into the composition of many names of places, *e.g.*, Stow-market, Stow-upland, Bridstow ('St. Bridget's place'), Elstow ('Helen's place'), Bristol, originally Briegstow ('the place at the bridge'), Tavistock ('the place on the Tavy'), Stoke-upon-Trent, Stoke-Pogis, &c. When used as a prefix, 'Stoc' often denotes the chief place of a district, as Stockton ('the chief town,' *i.e.*, on the Tees), Stockport ('the chief port,' *i.e.*, on the Mersey). Stoc, however, is not merely English, it is Teutonic, and occurs in a somewhat different sense in German and Scandinavian topography, as *Hoch-stock* ('the high hill'), Stockholm ('the island built upon *stakes*').

Stow, John, born in London in 1525, was by profession a tailor, but early devoted himself to the 'delectable study of antiquities.' Having published a *Summary of the Chronicles of England* (1561), he wholly forsook the tailor's board, and wandered over England collecting the documents dispersed at the Dissolution for a great historical work he had in view. This purpose he only so far fulfilled that in 1580 he issued the *Annals of England*, the *Survey of London* in 1598. This last work was entirely recast by Strype (q. v.); the others were reprinted in their author's lifetime, but they seem to have brought him little profit, since after five-and-forty years of chronicling he was driven to beg his bread. James I. gave him a patent authorising him to collect gratuities (1604), and he died in London, 5th April 1605. See the *Life and Writings of J. S.*, by Thoms, prefixed to his edition of the *Survey* (Lond. 1875).

Stowell, William Scott, Lord, elder brother of Baron Eldon (q. v.), was born at Howorth, Durham, 17th October 1745, and educated at Newcastle, whence he passed to Corpus Christi College, Oxford, in 1761, graduating in 1767. From 1773 to 1785 he was Camden reader of ancient history, taking his degree of D.C.L. in 1779. On the nomination of Dr. Johnson he became a member of the Literary Club, and soon won a conspicuous place in the intellectual society of London. Called to the bar in 1780, he rose rapidly in his profession, becoming in 1798 judge of the High Court of Admiralty and member of the Privy Council. In 1790 he was chosen M.P. for Downton, and in 1801 one of the representatives for Oxford, a post he continued to hold till he was called to the House of Lords in 1821. S. retired from the Court of Admiralty in 1828, and died 28th January 1836. He never published any legal treatise, but his judgments, especially on questions of international law, reported by Dr. Dodson and revised by himself, are highly prized by legal experts. In the opinion of Lord Brougham 'they ought to form part of every classical library of English eloquence, or even of national history.'

Stow'market, a town of Suffolk, on the Gipping, 12½ miles N.N.W. of Ipswich by rail. Amongst its buildings are the church of St. Peter and Mary (restored 1867, at a cost of £2000), a Roman Catholic church (1877), an Independent chapel (rebuilt 1861 on the site of the older chapel of William Godwin), the Corn Hall (rebuilt 1872), and the Literary Institute (1875). In the vicarage gardens is a mulberry tree planted by Milton. Machine-works employ 100, chemical-manure works 40, and a gun-cotton factory 130 hands, the last having in 1871 been the scene of an explosion, by which 24 persons were killed and 72 wounded. S. publishes one weekly newspaper. Pop. (1871) 4146. See Hollingworth's *History of S.* (1844).

Stow-on-the-Wold, a market-town of Gloucestershire, England, 28 miles S.S.E. of Evesham by rail, has a 14th c. parish church, a Gothic town-hall, erected (1877) at a cost of £4000, and malting and brewing industries. Pop. (1871) 2040.

Strabane', a market-town of Tyrone, Ireland, 14½ miles S.S.W. of Londonderry by rail, on the Mourne, which is connected by a canal 4 miles long with the navigable Foyle. It has one Catholic and one Anglican church, four chapels, and two shirt factories employing about 2000 women. Pop. (1871) 4309, of whom 2675 were Catholics.

Strabis'mus. See SQUINTING.

Stra'bo, the geographer, was born at Amasea in Pontus, about 66 B.C. (?) 54 B.C. (*Clinton*). Of his personal history the little that is known is gleaned from passages in his own work. On the mother's side he was descended from a Greek family closely connected with the kings of Pontus. Of his father we know nothing. The dates of S.'s visits to most of the countries through which he travelled are very doubtful. In B.C. 29 we know he was at Gyaros on his way to Corinth. In 24 B.C. he was with his friend Ælius Gallus in Egypt. When he first visited Rome he must have been of mature years.

The name S., 'squint-eyed,' is originally Greek, and its origin is obvious, but whether any of his ancestors bore it is uncertain. His preceptors were Tyrannio of Amisus, Aristodemus of Nysa, and Xenarchus of Seleucia. His acquaintance with history, mythology, and the poets of Greece attests at once the thoroughness of his education and his general culture. Professional life had evidently no charm for him. He seems to have been possessed of ample means, which he expended on travel, the results of which, after a lifetime's toil, he has bequeathed to us in his *Geography*. But S. also devoted himself to philosophy, and is cited by Plutarch (Lucullus 28, Sulla 26) as S. the philosopher. His work entitled *Historica Hypomnēmata* in forty-three books is supposed to have contained a narrative of the events from the close of the *History* of Polybius to the battle of Actium. The facts recorded in the *Geography* of S. are in great measure the result of his own observation. Yet there exists a vast difference in his treatment of different countries. In the case of some he is almost microscopic in fulness of detail. Of others he is content with a hasty and cursory description. The range of his travels is a wide one, embracing the territories from Armenia to Tyrrhenia westward, and from the Euxine to Ethiopia southward. In his work he is largely indebted to the geographers who preceded him—Eratosthenes, Artemidorus, Polybius, Posidonius, Aristotle, Theopompus, Thucydides, Aristobulus, and others. Of Greece he seems to have seen less than of almost any country. He appears, however, to have obtained in Rome much information regarding the Transalpine regions. Strangely, he disparages the discoveries of Herodotus, and undervalues the works of Roman writers, quoting almost none save Fabius Pictor, Asinius Pollio, and Julius Cæsar.

The principal value of S.'s works lies in his method. The number of historical facts recorded by him is enormous. The date of his death is unknown, but it must be placed between 21 and 25 A.D. As a writer S. is always clear, simple, and unaffected. His *Geography* comprises 17 books; 2 introductory, 8 devoted to Europe, 6 to Asia, and 1 to Africa. The *editio princeps* is the *Aldine* (Ven. 1516). That by Falconer (Oxon. 1807, 2 vols. fol.) is a reprint of Almeloveen's reprint of Casaubon's edition, with no improvement in the text, but containing a collation of the Eton, the Escurial, and the two Medicean MSS. The edition of Adamantios Koray (Par. 1815–18, 4 vols. 8vo.) is the first notable critical text. That by Gustavus Kramer (Berl. 1844 *et seq.*) is the first really valuable one. In 1875 a MS. of the *Geography* was discovered in the abbey of Grotta Ferrata near Frascati, older than any of the 28 previously known MSS., and supplying many lacunæ. The best translations are those in German by C. J. Groskurd (3 vols. 8vo., Berl. and Stettin 1831–34). A fair English version with copious notes and a complete index was published in Bohn's *Classical Library* (Lond. 1854–56–57, 3 vols. post 8vo.). An excellent edition of the text is that of Aug. Meineke (Leip. Teubner 1852–53, 3 vols. 8vo., 2d edit. 1866). See also Heeren's essay *De Fontibus Geographicorum Strabonis* (Göttingen, 1823).

Stradell'a, a town of N. Italy, province of Pavia, 39¾ miles E.N.E. of Alessandria by rail. It was formerly fortified, and has two yearly fairs. Pop. (1874) 6119.

Stradell'a, Alessandro, an excellent composer, singer, and violinist, was born at Naples in 1645. He wrote well for the voice, and was styled by his admirers the 'Apollo della Musica.' Among his works the *Oratorio di San Giovanni Battista* (Rome 1676), and the opera-seria *La Forza dell' Amor Paterno* (Geneva 1678), are the most remarkable. S. was murdered in Genoa in 1678 by assassins in the pay of a rival in amour, an incident upon which the libretto of the opera by Flotow bearing his name is founded.

Stradiva'ri or **Stradua'ri**, a celebrated violin-maker, born at Cremona in 1644, was a pupil of Nicolo Amati, in whose employment he continued till 1700. Then he started for himself, and soon surpassed all his contemporaries in the excellence of his workmanship. Even yet he has no equal. His best instruments were made between 1700 and 1730, and now command from £200 to £600. S. died December 18, 1737. His sons, Francesco and Omobono S., possessed not a little of their father's art.

Straff'ord, Thomas Wentworth, Earl of, was born in London, 13th April 1593, and having been bred at York and St. John's College, Cambridge, made the 'grand tour' of Europe. Not yet nineteen, he married a daughter of the Earl of Cumberland, and two years later inheriting from his father the ancient estate of Wentworth Woodhouse in the West Riding, received the honour of knighthood. He sat in Parliament for Yorkshire (1614 and 1621), for Pontefract (1624), and York (1625), having obtained the post of *Custos Rotulorum* to the West Riding (1615). From his first entry on public life he sought employment in the service of the Crown, but thwarted by Buckingham's jealousy, joined the Opposition and came to be suspected by the Court. Pricked, with five fellow 'patriots,' for sheriff, and thus shut out from Parliament, he modestly applied for the presidency of the Council of the North, and for answer was deprived of his keepership of the Rolls. 'Since they thus weakly breathe on me a seeming disgrace,' said Wentworth, 'I shall crave leave to wipe it away as openly as easily;' and having suffered six weeks' imprisonment in the Marshalsea for refusing the royal loan (1627), he became, as member again for Yorkshire, one of the hottest and ablest advocates of the Petition of Right (1628), protesting, 'Should I not faithfully insist for the common liberty of the subject to be protected whole and entire, may I be set as a beacon on a hill for all men else to wonder at.' Brave words from one who three weeks after the prorogation made friends with Buckingham and was created Baron Wentworth, on Buckingham's death to be raised to the rank of viscount, sworn of the Privy Council, and appointed President of the Council of the North (October 1628). Knowing that England's welfare depended on far-seeing government, and conscious of his own capacity, he set himself to the task of making men better against, or at least without, their free consent. He, the self-chosen captain of the ship of state, must exercise a 'thorough' discipline, mutiny must be checked by the heaviest penalties. So in the north he aimed at the improvement of the poor and relief of commerce, whilst obtaining a commission 'to hear and determine offences according to the course of the Star Chamber, whether provided by Acts of Parliament or not;' and in Ireland, of which he became Lord Deputy (1632), he doubled the revenue, founded the linen manufacture, cleared the seas of pirates, established a well-paid, disciplined army, and did his best to reform the Church, always by just, if possible, if not by other, means. To Laud (q. v.), his coadjutor across the channel, he wrote, 'The king is as absolute here as any prince can be;' but England, he found to his cost, was less amenable than Ireland, or than the England of Elizabeth. The Bishops' War brought Wentworth, now Earl of S. (1640), to Charles' side; with Charles he marched northwards and shared the reverses of the Scottish campaign, reverses that forced the summoning of the Long Parliament. It met on November 3, and on the 11th S.'s impeachment was moved by Pym (q. v.), in a speech which, attacking the man, arraigned the system of which that man was head. Sent to the Tower in spite of the king's safe-conduct, and placed at the bar 22d March 1641, he for fifteen days baffled the charges of his assailants, well-nigh the entire House, with marvellous eloquence melting them even to tears. Suddenly the Commons, finding the Lords were wavering, dropped the impeachment for a bill of attainder, which, under intimidation, was only passed by a majority of seven. The pitiful king gave his consent, after a feeble plea for mercy, ending, 'If no less than his life can satisfy our people, *fiat justitia*.' With 'Put not your trust in princes' on his lips, S. passed to the scaffold, bending below Laud's prison window to

receive a blessing from his old friend's outstretched hand, and upon Tower Hill he died valiantly, 12th May 1641. The 'lost archangel,' the 'Satan of the apostasy'—these are Macaulay's titles for the 'wicked earl,' whose one great fault was his lack of sympathy with the times and country in which he lived. He was indeed ambitious and ill-advised, unloving and unlovable, haughty and self-contained, but a man of wonderful parts and industry, not more unscrupulous than Burleigh, Cromwell, or Hastings (men whom the world delight to honour), and faithful to his master unto death. See S.'s *Letters and Despatches*, edited by Dr. Knowles (1739); the Histories of Hallam, Macaulay, Ranke, Green, and Gardiner; the latter's *Puritan Revolution* (Lond. 1876); vol. ii. of Forster's *British Statesmen* (Lond. 1831); Mozley's *Essays, Historical and Theological* (Lond. 1878); A. H. Hamilton's 'S.' in *Fraser* (November 1878).

Strain, in kinematics, is any definite alteration in the form or dimensions of a given portion of matter. When the Stress (q. v.) which produces the S., or the stress which is called into action by the S., is taken into consideration, the question becomes one of dynamics. In solid bodies S. is always accompanied with internal stress, and this property of exerting stress when strained is called Elasticity (q. v.). Thus a coiled string, or a bent bow, is an example of a strained body, and the external force which each exerts is the resultant of the stresses produced in its elements by the S. The kinematics of strains is discussed in considerable detail in the opening chapter of Thomson and Tait's *Natural Philosophy*, and the connected subject of elasticity in bodies is treated of in the chapter bearing upon statics in the same work.

Strain, in music, in general a song or tune, or a part thereof; in particular a piece of music marked off by double bars.

Straits Settlements, the general designation of the British possessions in the Straits of Malacca, comprising Singapore (q. v.), Malacca (q.v.), and Penang (q. v.), or the Prince of Wales Island, including the province of Wellesley. They were made a separate dependency of the British crown in 1853, and remained under the jurisdiction of the Governor-general of India till 1867, when they were placed under the administration of a governor residing at Singapore. Area, 1445 sq. miles; pop. (1871) 308,097, of whom 7655 were whites. The revenue amounted (1877) to $1,723,466, the expenditure to $1,589,143; the estimated revenue (1878) to $1,916,000, the expenditure to $1,691,000. The native states of this peninsula (Queda, Perak, Salangor, Rambow, and Johor) are bound by treaty to the English crown, and have an aggregate area of 21,460 sq. miles, and a pop. of 209,000. In time of peace, a thousand English troops and a few vessels are sufficient to maintain order; but this force was greatly increased during the revolt in Perak (q. v.) in 1875-76. Smuggling is carried on extensively, and deeds of violence are not unfrequent in the outlying districts. The governor of Dinding, an island off the coast of Perak, was murdered by Chinese robbers, 26th November 1878.

Stral'sund (Scand. 'the arrowy strait'), a fortified seaport of Prussia, province of Pommern, on the Strela Sunde, a strait 2 miles wide, separating the island of Rügen from the mainland, 145 miles N. of Berlin by rail. The town itself, a fortress of the second class, is entirely surrounded by water, and communicates with the mainland by three bridges. It has a quaint medieval appearance with its lofty-gabled houses; among its chief buildings are the vast brick-built Marienkirche (1416-78), a fine Rathhaus with a rich façade (1316), and the Nicolaikirche, adorned with a carved wood altar of the 15th c. Besides its industries in tin wares, paper, tobacco, oil, spirits, and mirrors, it has a large trade in grain, wool, cattle, and horses. The harbour is protected by the fortified islet of Dänenholm. Pop. (1875) 27,765. Founded in 1209 by Jaromar of Rügen, it was second only to Lübeck among the Hanse towns of the Baltic in the 14th c. It was on the side of the reformed faith, and of Sweden in the Thirty Years' War, and was attacked by Wallenstein (1628), who swore to take it 'though attached by chains to heaven.' But S. was aided by Danish and Swedish vessels, and the besiegers eventually withdrew with a loss of 12,000 men. S. belonged to Sweden till 1815, when it was ceded to Prussia.

Strange, Sir Robert, an English engraver, was born in Pomona, one of the Orkney Islands, July 14, 1721. He had begun business in Edinburgh as an engraver when the Pretender came to Scotland in 1745; but the part which he took in assistance of the Jacobite cause rendered it advisable that he should leave the country for a time. At Rouen and Paris he studied under Le Bas and Descamps, and at a later period pursued his art at Rome, Florence, Parma, and Bologna. Finally returning to England, he earned a high reputation as an engraver, and acquired no inconsiderable fortune. He was knighted in 1787, and died in London, July 5, 1792. Among his finest efforts are reproductions of Raphael, Domenichino, Guido, Guercino, Salvator Rosa, and Carlo Dolci; but perhaps his technical skill is nowhere more strikingly displayed than in the two plates for Hunter's *Gravid Uterus*, one of which Sir James Simpson pronounced the most perfect work of art in its kind. S.'s hostility to the Royal Academy, from which he was excluded as only an engraver, gave birth to his *Inquiry into the Rise and Establishment of the Royal Society*. He also wrote but never published a *History of the Progress of Engraving*, and a portion of an autobiography which he left unfinished. It is given in Mr. Dennistoun's interesting *Memoirs of Sir R. S.* (2 vols. 1855). The Rev. Francis Woodward has prefixed a life of S. to his *Photographic Reproduction of Twenty of S.'s Finest Engravings* (1874).

Strang'ford, Viscount, the Irish title conferred in 1628 on Sir Thomas Smythe, descendant of an old Wiltshire yeoman family, which in the 16th c. had migrated to Osterhanger, Kent.—**Percy-Clinton-Sydney Smythe**, sixth viscount, was born 31st August 1780, and having graduated at Trinity College, Dublin (1800), entered the diplomatic service. In 1801, the same year that he succeeded his father in the title, he was appointed secretary of legation at Lisbon, where he translated Camoens' *Rimas*; and afterwards he was ambassador to Portugal (1806), Sweden (1817), the Sublime Porte (1820), and Russia (1825). A liberal patron of letters and the arts, he bought back Osterhanger, squandered away by the second viscount, was raised to the English peerage as Baron Penshurst, and died 29th May 1855. His son, **Percy-Ellen-Frederick-William Smythe**, eighth and last viscount, was born at St. Petersburg, 26th November 1825, and educated at Harrow. A postmaster of Merton, he began at Oxford the study of Arabic and Persian, and while attaché at Constantinople (1843), and Oriental secretary during the Crimean War, he thoroughly mastered these and innumerable other languages (Turkish, Afghan, Slavonic, Teutonic, Celtic, Basque, &c.), becoming, in Mr. Freeman's words, 'our greatest English philologist.' His knowledge of Eastern politics was equally profound; if any man could have solved the 'Eastern Question,' that man was he. In 1857, succeeding to the family honours, he returned home; in 1862 married Emily, Admiral Beaufort's daughter, and author of *Travels in the East and on the Adriatic*; and thenceforth lived chiefly in London, where he died, 9th January 1869, being at the time of his death president of the Asiatic, and one of the foremost members of the Geographical Society. With all his infinite erudition he published nothing beyond a few *Quarterly*, *Saturday*, and *Pall Mall* articles, and some chapters contributed to his wife's *Eastern Shores of the Adriatic*; and his posthumous *Letters and Papers on Philological and Kindred Subjects* (Lond. 1878) serve but to show what might have been. See Fonblanque's *Lives of the Lords S.* (Lond. 1878).

Strangula'tion is defined by M. Tardieu as 'an act of violence, in which constriction is applied directly to the neck, either around it or in the fore part, so as to prevent the passage of air, and thereby suddenly suspending respiration and life.'

A sudden and violent compression of the windpipe causes almost immediate insensibility and death; but when a ligature or bandage is used, death takes place much more slowly, and is attended with convulsions. In cases of S. a much greater degree of violence is employed than is necessary to cause death, and hence the external evidences are generally apparent; but if no great mechanical injury has been done to the muscles and vessels of the neck, there is a chance of recovery if the cause of constriction be removed, air being permitted to have access to the lungs within a period of five minutes. When there is suspended animation, Artificial Respiration (q. v.) may be practised. The more prominent symptoms of death by S. are thus described by Dr. Taylor:—'The face is commonly livid and swollen, the eyes wide open, prominent, and congested, and the pupils are dilated. The tongue is swollen,

dark-coloured, and protruded; it is sometimes bitten by the teeth, and a bloody froth escapes from the mouth and nostrils. See *The Principles and Practice of Medical Jurisprudence*, by Dr. Taylor (Lond. new ed. 1873).

Stran'gury (Gr. *strangx*, 'that which oozes out,' and *oureō*, 'I micturate') is a symptom of various affections of the urinary organs. It consists in a frequent and irresistible desire to pass water, the urine being discharged in small quantity and accompanied with scalding, cutting pains in the uretha, which sometimes extend to the bladder, the kidneys, and the rectum. S. may be caused by idiopathic urethrites, by gonorrhœa, or by such irritating substances as cantharides and oil of turpentine, or by gravel or calculus in the bladder. The principal treatment consists in the removal of the cause; and, in addition, the following means may be adopted. The warm sitz-bath, or hot fomentations over the bladder, should be applied, and an injection of starch and tincture of opium, a wine-glassful of the former to a drachm of the latter, should be administered. Mild, mucilaginous drinks of barley or rice-water may be freely given to render the urine less irritating.

Stranraer', a royal burgh and seaport at the head of Loch Ryan, and the principal town of Wigtownshire, 72½ miles W. of Dumfries by rail. The chief buildings are the castle, erected early in the 16th c., occupied by Graham of Claverhouse in 1677; the new town-hall and court-house, erected 1872-3, opened January 1874, the finest public building in Galloway; the Wigtownshire combination poorhouse, with accommodation for 352 inmates; the self-supporting reformatory, licensed to contain 100, partially burned November 1878; St. John's Church (1841); Sheuchan Church (1842) and St. Joseph's Roman Catholic Chapel. S. has no manufactures, and its prosperity depends entirely on the agricultural interest. The harbour is capable of receiving large vessels only at the East Pier, formed (1861) in connection with the Portpatrick Railway, and from which steamers now ply daily to and from Larne. Since the opening of the railway, connecting S. with Glasgow *via* Girvan (1876), much of the Glasgow and Belfast transit trade, as well as that of the N. of England, has passed through S. by the 'Short Sea Passage' to Ireland. In 1877 there entered 758 vessels of 109,813 tons, and cleared 558 of 99,659 tons. S. unites with Wigtown, Whithorn, and New Galloway in sending a member to Parliament. Pop. (1871) 5941.

Strap, in Carpentry, a band of iron bolted to several timbers to hold them together.

Strass'burg (Fr. *Strasbourg*), a celebrated city of Germany, and a fortress of the first class, capital of the Reichsland, Elsass-Lothringen (prior to 1871 of the French Bas-Rhin), at the confluence of the Ill and Brusche, 2 miles from the left bank of the Rhine, with which it is connected by two canals, 88¾ miles N. of Basel by rail. The pentagonal citadel at the E. end (erected by Vauban, 1682-84), and most of the French fortifications, were demolished by the Germans during the bombardment of 1870, but their reconstruction was commenced in 1873, and has since been actively carried on in conjunction with a system of twelve detached forts, to include Kehl on the right bank of the Rhine, which is here crossed by a bridge of boats and a splendid railway bridge. S. is irregularly built, but contains many fine streets and squares, among these the Gutenbergsplatz with a monument to Gutenberg (1840), the Klebersplatz containing a monumental pillar to General Kleber, and the Brogliesplatz, laid out by Marshal Broglie (1740), and in which stand the Stadthaus and the theatre (destroyed 1870, rebuilt 1873). From the S. end of the latter square, the Blauwolkengasse leads to the Stein Strasse, entirely destroyed in 1870, but newly laid out since, and now the finest street in the city. The principal edifice in S. is the Minster, rising in the middle, one of the noblest examples of Gothic architecture. It was begun by Bishop Werner of Hapsburg in 1015 on the site of a church founded by Hlodwig about 510, and the interior was completed in 1275. The façade, the most admired part of the building, was begun in 1277 by Erwin of Steinbach and completed in 1399, while the spire of the N. tower, which reaches a height of 494 feet, was completed by John Hültz of Köln in 1439; the upper part of the S. tower still remains unfinished. The interior is 363 feet in length and 135 feet in width, the nave 42 feet in width and 99 feet in height. In the S. transept is the celebrated astronomical clock, constructed (1838-42) by Schwilgué to replace a similar clock by Dasipodius (1571), which was in use until 1789. Other buildings are the Church of St. Thomas (begun 1031, the choir 1270, the nave 1313-30), containing a magnificent marble monument to Marshal Saxe (1776); the former Prefecture, now the seat of the government; and the Academy Buildings (1825). The University, which was founded in 1621 and suppressed in 1794, was re-established by the Germans in 1872, and had in the summer of 1878, 710 students. In June 1878 were completed the plans for the new University buildings, which are to be erected at a cost of £525,000 (£112,500 contributed from the imperial treasury, £275,000 from the Elsass-Lothringen share of the war indemnity, the remainder from the contributions of the city, the district, and the two provinces). A library of 300,000 volumes has been formed to replace the town library which was burned in 1870. S. has extensive manufactures of porcelain, faience, gloves, beer, sausages, *pâtés de foi gras*, brandy, morocco and other kinds of leather, cloth, nankeen, linen, watches and clocks, tobacco, cutlery, straw-hats, and chemicals; also important commerce in corn, oil, hemp, and madder. There are (1878) 23 establishments for the making of *pâtés de foi gras*, the annual sales of which amount to £75,000. Pop. (1875) 94,346. S. occupies the site of the Roman *Argentoratum*, and was during the Middle Ages one of the most powerful of the free cities of the German Empire. It was seized by Louis XIV., September 30, 1681, and confirmed in his possession by the Peace of Ryswick in 1697. It afforded the French, in their wars with Germany, an admirable basis for operations against the S., but in the war of 1870 it was invested by the Germans, August 11. The bombardment commenced August 18, and after a gallant resistance, the governor, General Uhrich, was obliged to surrender with 451 officers and 17,451 men. By the Peace of Frankfurt, May 10, 1871, S. was finally restored to Germany. See Brucker's *Inventaire des Archives Communale de S. antérieure à* 1790 (vol. i. 1878).

Strat'egy (Gr. *strategia*, from *stratos*, 'an army,' and *ago*, 'I lead'), the science by which a general manœuvres his army and conducts his campaign so as to secure a probability of victory and to be able to reap its fruits. Strategical skill is required in order to establish suitable bases, to effect rapid and unexpected movements, to concentrate superior masses of troops to those of the enemy at salient points, to destroy the concerted action of the opposing army, and to break down their communications. The word strategy is applied to the operations of an army while beyond the reach of the enemy's fire. On the field of battle, strategy merges into tactics. The nature of a general's strategy depends in the highest degree on the character of a country, such as its roads, rivers, and mountains, and the configuration of its bases and frontiers. See the *Operations of War Explained and Illustrated*, by Colonel Hamley (1866).

Strat'ford-on-Avon, a Warwickshire market-town and Shakespeare's birthplace, 9 miles S.W. of Warwick by rail, stands on a gentle eminence above the right bank of the Avon, which is spanned by a 15th c. bridge of fourteen pointed arches and 1128 feet long. Shadowed by limes, the cruciform church of the Holy Trinity uprears a graceful spire of the 18th c., its transept and tower being Early English, chancel and nave of the Decorated style, with west window, lofty clerestory, and porch of the Perpendicular period. This church, the burial-place of Shakespeare and his family, was lovingly restored in 1840; and his birthplace, in Henley Street, was also renovated at the time of his tercentenary (1864), when a fund was started for the Memorial Theatre now (1878) in course of erection, and intended for the occasional celebration of Shakespeare's birthday, the representation of his plays, and possibly as a dramatic school for young actors. The grammar-school (founded 1482) occupies the upper part of the old Guildhall, adjoining which is the chapel of Holy Cross, late Perpendicular in style. Other buildings are the College School (opened in 1872), the church of St. James (1855), town-hall (1768), and market-house (1821); while in the neighbourhood are Clorton House (Rookwood's residence at the time of the Gunpowder Plot), and a monument (124 feet high) to Mr. Mark Philips, late member for Manchester, erected (1876) at a cost of £5000. S. publishes two weekly newspapers, and has a pop. (1878) of over 6000. See Wheler's *History of S.* (Str. 1806).

Strat'ford-de-Red'cliffe, Viscount, K.G., who as Sir Stratford Canning was for more than thirty years a prominent figure in the diplomatic history of the Eastern Question, was born in London 16th January 1788. He was the son of a London merchant, and cousin of George Canning. From Eton he went to King's College, Cambridge, in 1806, but left the next year on receiving an appointment from the Foreign Office. In 1808 he went to Constantinople, and was appointed Secretary to the Embassy in 1809. Returning to England in 1812, he resumed his studies at Cambridge, and graduated M.A. (1813). After performing high diplomatic service in Switzerland and the United States, and at St. Petersburg and Vienna, he was in 1825 appointed by his cousin, then Foreign Secretary, Ambassador at Constantinople. He was instrumental in fixing the boundaries of the new kingdom of Greece, and retained his post until, after the battle of Navarino, diplomatic relations with Turkey were broken off. Between 1834 and 1841 he represented King's Lynn in Parliament, and in 1841, having twice refused the Governor-Generalship of Canada, he was appointed by Sir Robert Peel Ambassador at Constantinople. This post he held for seventeen years—during the whole of the critical periods before, during, and after the Crimean War. His influence was always exerted to improve the condition of the Christian populations in Turkey, and at the same time to combat the influence of Russia at the Porte. His absence from Constantinople in 1852, at the time of Prince Menschikoff's mission, has been regretted in many quarters, but on the whole his services were great and undeniable (see Kinglake's *Invasion of the Crimea*). In 1852 he was raised to the peerage, and in 1858 returned to England and retired on a pension, only making occasional appearances in the House of Lords on questions of foreign policy, especially at the commencement of the late struggles in the East. In 1814 S. published a successful ode entitled '*Buonaparte*, and in 1873 resumed authorship, publishing a pamphlet entitled *Why am I a Christian?* and in 1876 a drama, *Alfred the Great at Athelney*.

Strath (Gael. 'a broad vale') is a name given in the Highlands of Scotland to the open valleys through which rivers flow, *e.g.*, Strathearn ('the vale of the Earn'), Strathspey ('the vale of the Spey'). In the case of Strathmore (the great S.'), however, it marks not the basin of a stream, but the long plain between the Grampians on the one hand, and the Sidlaws and Ochils on the other, which stretches from Stirling to Stonehaven.

Stratha'ven, a town of Lanarkshire, Scotland, about a mile W. of Avon Water, and 14 miles S. E. of Glasgow by the Caledonian Railway. In the vicinity is the romantic ruin of Avondale Castle, and some 6 miles S.W. are the battle-fields of Loudon Hill and Drumclog. Pop. (1871) 3645, chiefly employed in weaving and in the trade in cheese, cattle, and 'Straven' veal.

Strathclyde', a former kingdom of the Britons, extending N. from the river Derwent in Cumberland to the Firth of Clyde, and inland from the shores of that Firth to the forest of Ettrick. It thus comprehended most of Cumberland, Westmoreland, Dumfries, Ayr, Renfrew, Lanark, and Peebles. 'Galloway,' as the name shows, was in the possession of an intruding race of Gaelic or Irish Celts. The population of S. was Cymric in the south, and, according to Skene, 'a Cornish variety' in the north. The capital was the fortified rock on the Clyde called by the Britons *Alcluith*, and by the Gaelic Scots of Argyllshire, *Dunbreatan* ('the fort of the Britons'), now Dumbarton. The chief place in the south of S. was *Caer Luel*, or 'Carlisle.' The rulers of the Northern Britons were not termed kings of S., but 'kings of Alcluith.' In the year 945, according to the English *Chronicle*, king Eadmund harried 'Cumbraland' (*i.e.* S.), and ceded it to the Scots, who for a century before this had been masters of the whole country N. of the Forth. It never regained independence, but was gradually merged in the expanding Scottish kingdom, though as late as the 12th c. it was held by David, son of Malcolm Ceanmohr, as a separate earldom. During his reign, however, which was marked by the introduction of feudalism into Scotland, it was finally incorporated with the rest of that country. The subsequent troublesome revolts of the 'Gallowegians' settled in the districts now known as Kirkcudbright and Wigtown found no support among the descendants of the S. Britons, who gradually became, through fusion with the Angles of Bernicia and Norman settlers in the reign of David, among the sturdiest defenders of the Scottish nationality. To this region belonged Wallace and Bruce; it is the thrice-sacred 'land of Burns;' and if Skene's interpretation of *Nennius* be correct, it was the scene of those dim and distant fights which have clothed the memory of Arthur with perpetual renown. See Skene's *Celtic Scotland* (vol. i. 1876).

Strathnairn', Hugh Henry Rose, Lord, a distinguished English general, belongs to an old Scotch family, who have now for three generations held the office of Clerk of the Parliaments. Born in 1803, he joined the 19th regiment in 1820, and first served in the diplomatic service in Syria as consul-general (1841), and at Constantinople as chargé-d'affaires (1852). In the Crimean War he acted as Queen's Commissioner at the French headquarters, and was wounded in the trenches. During the Mutiny he commanded with much success the force in Central India, and amongst other achievements captured the town of Jhansi. In 1860 he was appointed commander-in-chief in India, and in 1865 commander of the forces in Ireland. In 1866 he was raised to the peerage, and succeeded Lord Gough in command of the Royal Horse Guards in 1869. He resigned his command in Ireland in 1870, and was created field-marshal in 1877.

Strathspey', a Scotch dance, supposed to have been first practised in the district from which it received its name. It resembles the Reel (q.v.), but moves slower.

Stratio'tes (Gr. 'a soldier,' from the sword-like foliage) is an aquatic sub-diœcious plant, of the order *Hydrocharidaceæ*, growing submerged in ponds and ditches in most countries in Europe; it is native in England, and naturalised in Scotland and Ireland. In appearance it resembles somewhat an American aloe in miniature (hence its name, *S. aloides*); it has also been compared to the tuft of leaves of the pine-apple, thereby receiving the local name of 'water-pine.' The genus consists of this one species only. S. is a curious plant, but is very troublesome if it gains possession in any piece of water, spreading with great rapidity by its runners, and overpowering other vegetation: its rigid leaves make havoc of fishing-lines.

Stra'tum. Aqueous or sedimentary rocks—that is to say, all those formed by the gradual deposition at the bottom of seas or lakes of material brought down to them by rivers, &c.—show such material to be spread out evenly in beds or layers, technically known as *strata*. The term is also applied, though less correctly, to such formations as peat and coal, which have not been deposited in water. Strata, though of course originally horizontal, are almost invariably found more or less displaced. They may, for instance, be *inclined*, *curved*, or even *vertical*; and sometimes are contorted, folded, or crumpled to an enormous extent. The *dip* of a S. is the amount of its deviation from the horizontal: the *strike* is the direction in which the strata extend at right angles to the dip. When one S. has been more or less tilted or inclined previous to the deposition of the succeeding one, they are said to be *unconformable*.

Strau'bing, an old town of Lower Bavaria, S. Germany, on the Danube, here crossed by two bridges, 23 miles E.S.E. of Regensburg by rail. Interesting buildings are Jakobskirche (1492-1512), the Gothic Gymnasialkirche (1430), with a fine monument of Duke Albrecht II., and the Schloss once occupied by Duke Albrecht III. and his beautiful but ill-fated wife, Agnes Bernauer, who was buried in the churchyard of St. Peter. S. has brewing, tanning, silk-weaving, a salt and powder magazine, and a considerable river traffic in live stock and corn. Pop. (1875) 11,614.

Strauss, David Friedrich, was born, 27th January 1808, at Ludwigsburg. His father was a retail merchant, and a man of considerable mental culture. His mother was a highly-gifted and well-educated woman, and her influence told powerfully on her son's character. When fourteen years old S. entered the lower Evangelical Seminary at Blaubeuren, where he had Kern and Bauer as his teachers. In 1825 he became a student at the University of Tübingen. In the Evangelical Theological College his old masters were soon after appointed professors there, and his after life showed the influence of their teaching. At Tübingen he occupied himself in mystical dreams, in the study of Schelling, and in the composition of poems. He afterwards studied

Schleiermacher, and then gravitated, as all German intellect in these days did, to the Hegelian system. In 1830 S. concluded his college life, and after a short time spent at Kleiningersheim as assistant to the parish clergyman, he went as interim professor to the college of Maulbronn. He spent a part of 1831-32 at Berlin, and then settled at Tübingen, where he acted as repetent (assistant) at the Evangelical College. There he published in 1835 his celebrated *Leben Jesu* (Tüb. 1835-36; 4th ed. 1840). The main question of the book is, 'Whether, and how far, all that is told us by our four Gospels really happened?' The answer implies not merely a complete elimination of the supernatural element, but even goes to prove that we can never really be sure whether any special fact is historical or not. 'The greater part of the Gospel records contains either no historical matter at all, or historical matter so disfigured that it is scarcely recognisable as such.' But whence these writings? They are myths: they are not history. They were not purposely invented: they *grew*. Their centre is a human personality glorified by the passionate devotion of his followers, who saw in him the fulfilment of the promises of the older Jewish Scriptures. But if this mythic element be removed, we have 'merely the general outline of the life of Jesus from his public appearance to his death on the cross.' Only of humanity, not of any individual man, can the attributes connected with the conception of Christ be predicated. The *Leben Jesu* produced a powerful impression, and a storm at once arose against its author. He was removed from his office and appointed teacher in the Lyceum of Ludwigsburg, but this post he resigned in the course of a year and proceeded to Stuttgart, where he was engaged in preparing new editions of the *Leben*, and in the publication in three parts of *Streitschriften* (Tüb. 1837-38), a series of brilliant essays in which his critics were sharply criticised. In 1839 he published his *Zwei friedliche Blatter*, and *Charakeristiken und Kritiken*, containing further exposition of his views (Altona 1839, and Leip. 1839). That same year the Zurich Government offered him a theological professorship in the Zurich university, but the storm which immediately arose caused this appointment to be revoked. In 1840-41 S. published *Die Christliche Glaubenslehre*, 'an historical consideration of Christian theology,' carried out on the same lines as the *Leben Jesu*, for 'the true criticism of dogma is its history.' It was not till 1864 that he again published a volume on theological subjects. In the interval he employed himself in literary studies resulting in Schubert's *Leben in seinen Briefen* (1849), the Biography of his friend Märklin (1851), the *Leben und Schriften Nicodemus Frischlin* (1856), the poet and philologist, *Ulrich von Hutten* (1858-60), the *H. S. Reimarus* (1862), and *Kleine Schriften* (1862-66). In 1864 the result of a revived application to theological pursuits was seen in the publication of his *Das Leben Jesu für das Deutsche Volk* (Leip.), followed by *Der Christus des Glaubens und der Jesus der Geschichte* (1865), a criticism on some recently-published lectures of Schleiermacher, and *Die Halben und Die Ganzen* (1865), an attack on the orthodox Hengstenberg and the rationalistic Schenkel. The latter in special is very severely criticised on account of alleged ambiguity, and attempts at a false and unscientific reconciliation between science and religion. His last important work, published in 1872, was *Der Alte und der Neue Glaube*. Here the result of his convictions is stated with unhesitating boldness and uncompromising honesty. He asks, and answers in the negative, the question, Are we still Christians? and then proceeds to propound a materialistic theory of the universe, and a 'religion of the future' founded upon it. Like most books of the kind, the work is strong in its negative but weak in its positive aspects. During the last years of S.'s life he frequently changed his residence, but finally returned to his birthplace, where he died February 8, 1874.

The storm raised by S.'s works was caused, not merely by the fact that he attacked the sacred and cherished convictions of the multitude, but that he was equally hostile to the rationalistic party in the Church, who attempted to reconcile what he believed to be contradictories, and he has powerfully exposed their inconsistency and the unstable nature of their standpoint. In politics, moreover, his views though liberal were not decidedly so, and he thus alienated another party, who, as far as theological beliefs were concerned, occupied the same platform. His works exhibit profound scholarship. The style is clear, direct, and forcible. Sarcasm is employed but sparingly, and always with the best effect. Frequently a phrase expresses in the happiest manner the general aspect of a question, or some aphoristic truth charms and edifies the reader. Personally, S. was a person of modest and retiring disposition. An ardent love of truth and fearless honesty in its expression were among the most prominent features in his character. The following translations into English of S.'s works may be referred to, *Life of Jesus* (3 vols. Lond. 1846, popular revised edition Lond. 1865), *The Old Faith and the New* (2d ed. Lond. 1873). See also Zeller's fine sketch, *S. in seinem Leben und seiner Schriften* (Lond. 1874). See Hausrath's Biography (vol. i. Leip. 1878). A selection from S.'s *Werke* was edited by Zeller (vols. i-vi. Bonn. 1876-77). In 1877 appeared his *Gedenkenbuch*, a collection of pieces of poetry, edited by S.'s son, in which certain fine and even tender susceptibilities are unexpectedly revealed in the great disbeliever.

Straw'berry (Old Eng. *streowberie*, 'either from its straw-like halms, or from their lying strewn on the ground,' *Prior*) or *Fragaria*, so called from the fragrant fruit, is a genus of perennial herbs with creeping stolons belonging to natural order *Rosaceæ*. The leaves are trifoliate, the flowers white or yellow, the calyx persistent, of 5 lobes with 5 bracteoles at the base, and numerous stamens and achenes. Professor Decasne's recent monograph of the genus describes 10 species; but Dr. Hooker says '3 or 4 species.' They are distributed through temperate and mountain regions of the N. hemisphere, occurring also in S. America, the Sandwich Islands, and Bourbon. *F. vesca*, the wild S., is a common British and European plant of shady places, flowering in April and May, and producing a small obovoid or globose, red or whitish, pleasant-tasted fruit, during the summer. From it numerous garden varieties have been raised. Possibly the distinct-looking plant called in cultivation the 'haut-bois S.' is derived from it. The scarlet S. (*F. Virginiana*), the wild S. of Canada and the United States, has been grown in Europe for 250 years. It has many varieties, differing in form of fruit from round to oblong, and in flavour from sugary to brisk acid. *F. Chiloensis*, the Chili S., is more tender than the above, but is of vigorous growth, and yields a good fruit in climates suitable to its growth. By crossing and re-crossing, however, very valuable and sufficiently hardy sorts have been obtained from it, particularly the kind so extensively grown and so well known under the name of 'British Queen.' The S. is much valued for dessert, is of very general use in confectionery, and is recommended medicinally in cases where acid fruits are injurious. The fruit should be gathered when quite dry. All the kinds are propagated by runners planted in rows or beds, and should be so situated as to have free exposure to sun and air. The plantation requires renewal every third, fourth, or at latest every fifth year. Strawberries may be forced with advantage in the peach-house, vinery, orchard-house, or in warm pits. The Barren S. (*Potentilla Fragariastrum*, formerly *Fragaria sterilis*) is something like *F. vesca*, which it often accompanies in Britain, but has no runners.

Straw-Plait' and Straw-Hat' Manufacture. These industries are in England localised in the counties of Bedford, Herts, Bucks, and Essex, the principal centres being Luton, Dunstable, St. Albans, and Hitchin. Straw-plaiting is pursued by the females of the villages, who dispose of their work to dealers, or carry it to the weekly markets of Luton and other towns, where the plait is sewed up into hats, &c. The census of 1871 showed that upwards of 45,000 females and only 3590 males were engaged in the S.-P. industry. The industry at Luton dates from 1605, when James I. brought from Scotland the descendants of straw-plaiters imported into that country from Lorraine by Mary, Queen of Scots. The straw is obtained from the red lammas or white chittim wheat, grown mainly on the northern slopes of the Chiltern Hills, in Bedfordshire, and in Herts, Bucks, Oxfordshire, and Berkshire. To prepare the straw for plaiting, it has to pass through the several operations of having the ears cut away, the sheath stripped off, and the root end removed. The straw is then 'sorted' into different thicknesses by being passed through sieves, cut into short lengths, and bleached by exposure to sulphur fumes in steam-chests. Each length is next 'split' into strips by drawing it through a tube armed with from 4 to 7 steel slitters. 'Milling' under rollers to render the straws less stiff is the next operation, which is followed by 'wetting' to soften them. 'Plaiting' comes next,

after which the loose ragged ends are clipped away, and the plait is 'bunched' or divided into links, each 10 yards long. Two links are reckoned 'a score,' and the market price of it ranges from 2d. to 3d., according to the character of the plait, of which there are several varieties. The straw is usually dyed in the plait, but sometimes when whole before being split. Straw hat and bonnet making is to a great extent a domestic trade, being carried on by families in their homes; but factories are also established at Luton and Dunstable, where females sew the plait into a hat form by machine or by hand, and add lining and trimming; while men stiffen the hats or bonnets with solution of gelatine, and attend the 'blocking' or pressing of them into their final shape in heated zinc moulds by hydraulic power, as well as the 'crimping' or impressing a pattern on the straw, which is also accomplished by pressure into engraved moulds. Tuscan plaits have been imported into Luton for upwards of 60 years without affecting the home plait trade, but during the last few years Chinese plaits, cheap, of inferior quality, and made of whole rice, have been introduced with very opposite results. A very important trade in hats, &c., with Australia, India, Cuba, and S. America, is annually increasing. The annual export of hats from Great Britain, which in 1863 was valued at £444,126, had in 1877 increased to £1,106,556. Straw-plaits and straw-hats are made to a small extent in London. Tuscan straw, of which Leghorn hats are made, is the stalk of wheat grown on poor soil, and cut while milky. The manufacture of Leghorn hats is pursued in the provinces of Vicenza and Bologna, and in Tuscany, where the industry has been established for centuries.

Strel'itzes (Russ. *Strjelzi*, 'to protect'), a Russian body-guard organised by Ivan the Terrible in the latter half of the 16th c., when the S. formed the whole standing infantry army of Russia, and soon amounted to 40,000 or 50,000 men. Their many privileges at length made them arrogant and unmanageable, so that they came to wield an influence in Russia like that of the Prætorian Guards at Rome or the Turkish Janissaries. For an insurrection against Peter the Great, the latter in 1698 disbanded the S., executing several thousands, and banishing the rest to Astrakhan, where they also were destroyed in 1705.

Strength of Mate'rials, in mechanics, forms an important part of the theory of structures, and includes the consideration of all questions relating to the straining of solids. A solid is said to suffer strain when it is in any way altered in volume or figure, and to effect such an alteration external force must be applied. If the strain is not carried so far as to cause disintegration of the solid—that is, if no *fracture* results—the force or resultant of the forces which produce the strain must be balanced by an internal force conditioned by the molecular structure of the solid. This internal force called into existence by the strain is the one aspect of the stress, of which the original force producing the strain is the other. To every strain, then, there corresponds a stress, which is regarded as the resultant of the stresses which act between the elementary portions into which the solid may be supposed to be divided. (See STRAIN.) When the strain is proportional to the stress—in other words, when Hooke's Law (*ut tensio sic vis*) holds—the body strained is said to be perfectly elastic (see ELASTICITY); and the elasticity of every solid, even for such cases as moistened clay, is sensibly perfect when the strain does not exceed a certain limit. For every solid, however, there are limits of strain which, if exceeded, give to the body a *set* or permanent alteration of volume or figure. Hodgkinson has proved that these limits depend on the duration of the strain, so that in all probability any strain if sufficiently long-continued would give a set to any body. There are several distinct kinds of strains to which a solid may be subjected, and these are given with their corresponding fractures in the following table taken from Rankine's *Applied Mechanics* —

	Strain.	*Fracture.*
Longitudinal.	Extension.	Tearing.
	Compression.	Crushing and Cleaving.
Transverse.	Distortion.	Shearing.
	Torsion.	Wrenching.
	Bending.	Breaking across.

The simplest example of resistance to stretching is afforded by a uniform bar subjected to a stress acting along its axis, say a suspension-rod with a mass attached to its lower end. The stress is here measured by the weight which produces the longitudinal strain; and each unit of length of the bar will suffer an extension, which within a certain limiting stress will bear a constant ratio to the stress. In other words, the modulus of elasticity or ratio of the stress to the extension per unit length of the rod will be nearly constant until the stress passes the limit of the *proof-stress*, which is defined generally as the greatest stress of which a strained solid can bear the repeated application without its strength being impaired. After this limit the extension increases faster than the stress until the breaking stress is reached, when the bar is torn asunder. In experimentally determining these constants for a given material, the stresses must be applied gradually; for it is found that a stress, which when suddenly applied produces fracture, can be resisted by the solid when applied gradually. Now, the work done by the stress is measured by the product of the strain into the *mean stress* in its own direction; and hence the work done in straining a solid to the limit of proof-strain is measured by the product of the strain into *half the proof stress* in the direction of the strain, which in most cases may be taken as a measure of the mean stress. In the case of the bar, this product (technically known as the *resilience* or *spring* of the bar) is the extension multiplied by half the proof stress. The strains to which boilers and pipes are subject under the pressure of the contained fluid belong to the same class of longitudinal strains as the stretching of a bar does, but their discussion is necessarily much more complicated. Resistance to compression is sensibly equal to resistance to extension, as long as the limit of the proof-strain is not exceeded. When, however, that limit is exceeded, the various modes in which the *crushing* may occur make the determination of the resistance difficult. Thus the strained body may split into fragments in the direction of the crushing force; or it may yield by bending or by shearing or sliding along oblique surfaces of separation; or it may swell laterally, like lead or wrought iron; or it may crush by crossbreaking, very similar to the crossbreaking of a beam under a transverse load. In these cases transverse strains are introduced, which accordingly fall to be considered. A shear is a strain produced by a tangental stress, which may or may not be constant in intensity and direction. In many ordinary structures in which plates, links, or bars are subjected to a direct pulling stress, the rivets or bolts which fasten them together are under the action of a shearing stress; and in such cases it is of importance that the pieces and their fastenings should be of equal strength. The nature of a simple shear is well shown geometrically by two parallelograms upon the same base and between the same parallels, the alteration of form being simply a sliding of the elementary portions over each other with the displacement proportional to the distance from the base, in the direction of which the shearing stress may be supposed to act. Except in very special cases, shearing invariably accompanies the last two kinds of transverse strains—torsion and bending. For instance, take the case of a horizontal beam in equilibrium under the action of the weight of its load, either applied at detached points or continuously distributed, and the pressures at its props, and consider any transverse section dividing the beam into two parts. The resultant of the forces acting over one only of these parts will have a shearing action at the cross-section, to resist which the particles at the cross-section must be able to exert an equal and opposite shearing stress; and, further, the moment of this resultant, taken with reference to the cross-section, or the *bending moment* exerted at the cross-section, must be balanced by an equal and opposite moment of resistance exerted by the particles at the cross-section. When the beam is bent, the side towards which the resultant external force acts is stretched and the other side compressed. Intermediate to these, there must be some layer in the beam which is neither lengthened nor shortened. This is called the *neutral surface*; and at any other layer a longitudinal stress is called into action, which, within the limits of proof stress, is proportional to the distance of the layer from the neutral surface. This stress is a pull or *tension* if the surface is stretched, a pressure or *thrust* if compressed: and this uniformly varying stress at any given cross-section constitutes a couple whose moment is equal and opposite to the bending moment at the cross-section. In the case of torsion, take a cylinder subjected to the twisting moment of a pair of equal and opposite couples applied to two given cross-sections. Between these cross-sections there is evidently distortion, and similar conditions of stress and strain exist at all

intermediate cross-sections; and the stress in any cross-section is a shearing stress, which is proportional to the distance from the axis. For detailed information on the subject, see Barlow on *S. of M.*, Moseley's *Mechanics of Engineering and Architecture*, Rankine's *Applied Mechanics* and *Civil Engineering*; and in Thomson and Tait's *Natural Philosophy*, vol. i., the subject is treated as a branch of statics.

Strepsip'tera (Gr. 'twisted-winged'), a group of insects usually ranked as a distinct order, and represented by such aberrant forms as the *Stylops*, or bee-parasite. The front pair of wings are represented by a pair of small twisted filaments which have given the group its name. Both sexes may be found living within the bodies of bees from May till June. The larvæ are produced within the female body, and are hatched in the latter month. They then fasten on the bodies of bees, the males issuing during the succeeding summer.

Strepsirhi'na (Gr. 'twisted-nosed'), a division of Monkeys or *Quadrumana* (q. v.) having twisted or curved nostrils, and found chiefly in Madagascar. The Lemurs, Aye-Aye or *Cheiromys*, Slow Lemurs, and Loris, belong to this group, which has also received the name *Prosimiæ*. From their brain-characters as well as from their *placentation*, the Lemurs (q. v.) especially are believed to occupy an intermediate position between carnivora and quadrumana.

Stress is a convenient term introduced by Professor Rankine to express the mutual action between any two portions of matter. Thus the pressure between a table and a book resting on it is of the nature of a S., which has two aspects, according as we fix our attention upon the table or the book. With reference to the former the pressure is *downwards*, with reference to the latter *upwards*, and these two forces, which according to Newton's third law are equal and opposite, form when regarded as a whole the S. Similarly the attraction of the earth for the sun and the attraction of the sun for the earth are opposite aspects of the same S., and the same can be said of all forces which obey Newton's third law, *i.e.*, of all known forces which invariably exist in pairs. The so-called centrifugal force is merely the one aspect of the S. whose other aspect is the force which acts upon the body normally to the path.

Stretch'ing-Course, in masonry and brickwork, a course of stones or bricks laid with their longer dimensions on the face of the wall, distinguished from a *heading-course*, in which the breadths of the stones or bricks are exposed.

Strett'o (Ital.), in music, means closely, concisely, in a quicker style, the opposite of largo. A S. in a fugue is the bringing closely together the subject and its answer; as, for instance, the entry of the answer into the fugue before the close of the subject. A *stretta* is a final coda to a piece taken in quicker time than the preceding movements, or the termination of an operatic finale.

Strick'land, Agnes, born at Roydon Hall, near Southwold, Suffolk, 19th July 1796, with her sister Susanna published *Patriotic Poems*, and by herself *Worcester Field* (1812), then after a silence of twenty years the Byronic *Demetrius* (1833), and a prose romance, *The Pilgrims of Walsingham* (1835). To a number of minor works succeeded *Lives of the Queens of England* (12 vols. 1840-49) and *Lives of the Queens of Scotland* (8 vols. 1850-59), in both of which her sister Elizabeth assisted her. They display a praiseworthy industry, and contain some curious matter in the way of historic millinery, but otherwise hardly deserve their bygone reputation, the copyright of the former fetching £6000. The same may be said of her *Lives of the Bachelor Kings of England* (1861), *Lives of the Seven Bishops* (1866), and *Lives of the Tudor Princesses* (1868); but her *Letters of Mary, Queen of Scots* (1843; new ed. 1873) is valuable so far as the letters themselves are concerned. In 1871 Miss S. received a pension of £100. She died at Roydon Hall, 13th July 1874.

Stric'ture is a term used in surgery to denote an unnatural contraction of a mucous canal such as the œsophagus, the rectum, or the urethra. There may be also S. of the lachrymal, salivary, and gall ducts, and of the ureter; but the term is most frequently applied to the first-mentioned cases, and when used by itself is generally applied to S. of the urethra. S. of the *urethra* is generally caused by a low inflammation of the submucous tissue of the urethra, or cicatrisation, the result of an accident; and the most frequent cause is the persistence of a neglected gonorrhœal discharge, or syphilis. *Traumatic* S., depending on an injury, is by far the most formidable form, the resulting cicatrix being usually very dense, hard, and contractile, so that, even after dilatation, it is very apt to recur. The most common seat of S. is in the bulbous portion of the urethra, but any part may be affected. The symptoms of S. are difficulty in making water, and straining, which may pass into total retention. The existence of a S. leads to gradual loss of tone and dilatation of the part of the urethra behind the S.; of the bladder; the uretus; and finally of the pelves of the kidneys, terminating in absorption of their cortical substance, suppressed secretions of urine, and death from uræmic poisoning. In general, however, the walls of the bladder are thickened, and its cavity perhaps diminished; and in the urethra there is almost always dilatation behind the S., unless relieved by ulceration and urinary fistula. The ureters are generally dilated, and the kidneys are as often affected by inflammation as by distension, resulting in small abscesses scattered throughout the organ. For treatment see URINARY ORGANS, DISEASES OF. For other forms of S. see ŒSOPHAGUS, RECTUM, LACHRYMAL APPARATUS, DISEASES OF.

Strie'gau, a town of Prussian Schlesien, on the S. water, 19 miles S.S.E. of Liegnitz by rail, with manufactures of linens and woollens. Pop. (1875) 10,614.

Stringen'do (Ital.), in music, a gradual quickening of the time; urging on the speed.

Strike. See DIP AND STRIKE.

Strikes and Lock-outs. A strike is the combining together of labourers in any particular branch of industry to discontinue their labour until certain demands made by them on their employers are satisfied. A lock-out, on the other hand, is a combination of the employers to resist such action by stopping their works. From the masters' point of view, strikes are most objectionable; from a labourer's, they appear to be in certain cases almost a necessity. How otherwise, they ask, can they ascertain whether or not their employers are taking an undue advantage of them by paying them less than the just value of their labour? From an economic point of view, strikes necessitate a terrible waste of money and of money's worth. The laws which ultimately govern the rate of wages are indeed beyond the powers of capitalists and labourers, and their temporary successes or failures in dispute. The rate of wages depends generally upon the ratio which the accumulation of capital bears to the increase of the population, and upon hundreds of fluctuations of various kinds. Combinations to resist these laws are expensive and really wasteful. They expose capital and labour to long periods of idleness, often with no satisfaction to either party in the end. Apart from those struggles which have resulted in a decided gain on one side, there have been countless strikes which have been drawn battles, and even in the most successful strikes it usually takes a long period of time before the increase of wages repays the labourer for the wages he has lost, or the diminution of wages the capitalist for the time his capital has been unemployed.

The laws regarding the remuneration of labour which formerly existed in this country were rigid and severe. The first labour statute of English law was passed about the year 1350, soon after the Great Plague had ravaged the country, and by diminishing the population had greatly increased the price of labour. This statute, combined with subsequent legislation, attempted to fix rates of wages, and to give power to levy severe penalties on those who paid or received more than those stipulated. Every man or woman, free or bond, under the age of threescore years, not having landed property or other means of support, was compelled to work for any employer requiring his labour for a fixed sum. A favourite penalty for recalcitrant labourers was the pillory, another the cutting off of an ear. For nearly five centuries, machinery was from time to time devised to fix undeviating rates for payment of wages, and this machinery constantly failed in struggling against those economic causes which really regulate the price of labour. It is to these unjust and selfish enactments that we may partly trace the heart-burnings on the part of the working classes, which have resulted in the wars or armed truces between capital and labour which have unfortunately characterised the present century. Combinations on the part of workmen to obtain a higher rate of wages were formerly treated as conspiracies, and were illegal until the year 1825. This was a

state of things certainly disadvantageous to the workmen. As employers naturally seek to absorb as much profit from labour and capital as possible, a depression in trade is usually followed by a reduction of wages, whilst the converse is seldom the case. Now a solitary workman, in an individual contract with a large capitalist, could have no power of meeting this grievance. If capital and labour, which should work together harmoniously for each other's good, are to be ranked on opposing sides with conflicting interests, it is only by means of organisations of labour that labour can enter the field on equal terms. Hence the necessity, in the eyes of the working classes, for trades unions, and of strikes as part of the machinery of these bodies for enforcing their demands.

The following are some of the more memorable strikes during the last half century. The 'Amalgamated Engineers' struck in the year 1852 against piece-work and overtime. The struggle lasted three months, the masters substantially gaining the day in the long run. It cost the society over £40,000 besides the loss of wages, and there were those who thought it would be the death of that body. On the contrary, the Amalgamated Engineers is now the largest and most flourishing of trade combinations. A gigantic strike of spinners took place at Preston (where a notorious strike occurred also in 1836) in 1853-54. It involved 20,000 persons, and lasted from the 15th October to the 1st of May. The loss of wages to the men was estimated at £3,000,000. The weekly drain upon the union's funds was nearly £3000, and the total actual loss occasioned by the strike was estimated at £628,216. On 6th August 1859, 24,000 labourers in the London building trade struck in connection with the nine hours' movement. This struggle was unsuccessful, and terminated on the 31st August. During the last few years many strikes have taken place in the coal industry, particularly in South Wales. A strike by 50,000 Welsh colliers in 1873, lasting nearly four months, resulted in a virtual gain for the men. Not so a similar strike of 60,000 men in the same district on 1st January 1875 to resist a reduction of 10 per cent. off their wages. The men had to succumb, and gradually returned to work toward the end of May. A strike of railway servants over the greater part of the United States through reduced pay, lasting twelve days and commencing 18th July 1877, was one of the most sanguinary and violent struggles of the kind which has ever happened. It led to encounters with troops, the loss of hundreds of lives, and a destruction of property estimated at £8,000,000. Few more determined strikes have taken place than that of the London masons for increased pay and shorter hours on 31st July 1877. Some firms yielded, but the majority of employers resisted the demands. The masters procured workmen from America, and on the arrival of the latter the unionists 'got at' them, and sent them back again. Little difficulty was experienced, however, in getting German, Belgian, and other foreign workmen, and the strike ended 14th March 1878. The loss in wages was £60,000. A large strike of cotton spinners in Lancashire to resist a reduction of 10 per cent. on wages began 18th April and ended 17th June 1878, the men ultimately submitting. The engineers of Liverpool and Birkenhead and of London struck (31st January 1879) against a reduction of wages, averaging 7 per cent., the masters refusing to compromise or to arbitrate. A late instance of oppression is the strike of the caulkers in Messrs. Elder's shipbuilding yard at Jarrow, because the masters refused to dismiss a man for doing more work a day than is prescribed by the union rules.

Till 1872 the agricultural labourers of England had no organization of any kind, and they were then as now the worst paid workmen in the kingdom. A National Union of Agricultural Labourers, managed chiefly by Joseph Arch, was inaugurated at Leamington, March 29, 1872, and the movement received considerable support from Mr. A. Herbert, M.P., and other influential sympathisers with poor Hodge. Agitation meetings were held in various parts of the country, and a lock-out of labourers belonging to the union began at Alderton, Suffolk, in March 1874, and the union ceased to support the locked-out labourers on 27th July. The agitation subsequently subsided. At present (December 1878) there is a lock-out of farm labourers in Kent and Sussex.

It is worth noting that where strikes have been for an increase of wages they have often succeeded, whereas they have seldom done so where the object of the strike has been to resist a reduction. This clearly shows that masters, as a rule, if loath to raise the wages of their employés, do not reduce them without strong cause. In strikes the masters lose money and the men suffer untold misery, often cheerfully undergone, to gain their purpose. A less favourable feature is the persecution of non-unionists and those willing to work, which is often persistently attempted by those who have struck. The evil of strikes to the community is very great. It primarily falls upon those unfortunate labourers whose labour depends upon the class who have struck. In factories the action of a particular class of workmen will frequently throw ten times the number of people out of employment. It then affects tradespeople dependent on the workmen, while the whole community loses the advantages of production. Strikes have greatly and permanently injured particular seats of industry where they have occurred, from orders being sent, and similar branches of industry being established, elsewhere. Thus Dublin lost its shipbuiling trade, Nottingham much of its lace trade, Macclesfield much of its silk trade. The customers of many English machine-makers have transferred their orders to France and Belgium, and whole branches of the cotton manufacture have been driven to America and other places.

Among the suggested remedies for strikes are Co-operation (q. v.) and Arbitration (q. v.). The former has yet scarcely emerged from theory into practice; the latter has been tried of late years with considerable success. See, besides the works under POLITICAL ECONOMY, *The Wages Question*, by F. A. Walker (New York, 1876); *Lectures on the Labour Question*, by T. Brassey (3d ed. 1878); *Work and Wages*, by the same (1872); and *Conflicts between Labour and Capital*, by G. Howell (1878).

Strogan'off, a noble family of Russia, descended from **Anika S.**, a rich Novgorod merchant of the beginning of the 16th c., who had large possessions in the Ural Mountains, established salt manufactories, and started the trade between Russia and Siberia. His three sons **Yakoff, Grigorij,** and **Semen S.** founded towns and fortified villages ('Ostrogs') on the river Kama, with their own troops defended their possessions against robber neighbours, and built fortresses in Siberia to check Mongol incursions. Semen, the youngest, supported by a nephew and by Yermak Timofeyeff, Hetman of the Don Cossacks, attacked the Mongols and took the capital Sibir (1581), with all Siberia. The S. family received now a monopoly of trade with Siberia, as well as other privileges, and from manufactories, mines, foundries, and gold washing gained great wealth, but in 1722 Peter the Great deprived its then representatives, the three brothers, **Alexander, Nicholas,** and **Sergei S.**, of all their privileges, only conferring instead of them the title of baron.—**Alexander S.** (1734-1811), son of Sergei, imperial chamberlain and privy councillor, was married to a relative of the Empress Elizabeth. He was made a count of the German Empire in 1761, and a Russian count in 1798.—His son, **Count Paul S.**, fought as a general against the French, and distinguished himself in 1814 at the battle at Craonne, where his only son fell by his side. He died in 1817, leaving a daughter heiress of his estates.—**Grigorij S.**, grandson of Nicholas S. (1770-1858), was in 1821 Russian ambassador at Constantinople. He was made a count in 1826, and imperial chamberlain in 1846.—His eldest son, **Sergei S.**, was from 1835 to 1847 curator of Moscow University, and in 1857 was appointed to direct the archæological excavations in Russia, of which he has prepared a series of valuable reports. He is also noted for his earnestness in stimulating art and science, and promoting the internal progress of Russia.—His younger brother, **Alexander S.**, born 1805, was from 1839 to 1841 minister of the interior, and in 1855 became governor-general of New Russia, with the task of restoring order in the Crimea and rebuilding Sebastopol.—His son **Grigorij**, imperial master of the horse, in 1856 formed a morganatic marriage with Maria, Archduchess of Leuchtenberg, eldest daughter of the Emperor Nicholas.

Strom'bidæ, a family of *Gasteropodous* Mollusca, in which the shell has a very deeply notched outer lip, and the *operculum* or plate used for closing the mouth of the shell is claw-shaped. The S. inhabit tropical seas. A very familiar species is the Giant Stromb or Fountain-Shell (*Strombus gigas*) of the W. Indies, which may weigh from 4 to 5 lbs., and is largely used in the manufacture of cameos. The name 'wing shells' is given to the S. from their large and expanded lip.

Strom'boli, the most north-easterly of the Lipari Islands (q. v.), off the N. coast of Sicily, is 12 miles in circuit, and has 1452 inhabitants. Its cone, 3022 feet high, is one of the few volcanoes that are constantly active. At regular intervals showers of stones are ejected, and these almost all fall again within the crater. The ancients regarded S. as the seat of Æolus, and in the Middle Ages it was held to be the entrance to purgatory. The island yields, besides sulphur and pumice-stone, cotton, fruits, and wine.

Strom'ness. See ORKNEY.

Strongyl'idæ. See STRONGYLUS.

Stron'gylus (Gr. 'round'), a genus of *Nematoid* worms belonging to the family *Strongylidæ*, of which this genus is the type. The *S. bronchialis* is a species infesting the bronchial tubes of man, the female attaining the length of an inch. The family characters of this group are a round thread-like body (hence the name), a round or oval mouth, and two terminal *spicules* provided for the male. The *S. bronchialis* is not of frequent occurrence as a human parasite. It was first discovered in 1790. Allied species (*S. paradoxus*) occur in the lungs of the pig, and (*S. micrurus*) in those of the calf. The *S. gigas* (otherwise known as *Eustrongylus gigas*) is notable as being the largest nematoid parasite found in man or other animals. It attains a length of over 3 feet (female), the male measuring 1 foot. Rare in man, *S. gigas* is found in almost all *Carnivora.*

Stron'say. See ORKNEY.

Stront'ium (Sr = 87·5), one of the metals of the alkaline earths, occupying an intermediate position as regards many of its properties to calcium and barium, the other members of the group. S. is less abundant in nature than barium, and occurs as a constituent in the minerals strontianite and celestine, which are respectively the carbonate ($SrCO_3$) and sulphate ($SrSO_4$). In the metallic state it is usually white, heavy, oxidisable in air, and decomposing water at ordinary temperatures. The most important compound is strontia (SrO), from which Davy first obtained the metal in 1808 by electrolysis. It resembles baryta, forming a white soluble hydrate (SrO,H_2O), which is the compound formed when the metal decomposes water. Strontia is best prepared by decomposition of the nitrate by heat; while the nitrate ($Sr(NO_3)_2$) and chloride ($SrCl_2$) are easily obtained by treating the mineral carbonate with nitric and hydrochloric acid respectively. S. also forms a dioxide (SrO_2), which is prepared as the corresponding barium compound is by exposing the monoxide to a strongly-heated current of oxygen. S. and its compounds burn with a very characteristic crimson flame, which gives a well-marked line or banded spectrum.

Stroph'ulus. See RED GUM.

Stross'mayer, Joseph Georg, a Croatian bishop, was born at Essek in Slavonia, 4th February 1815, and studied in the Diakovo seminary, at the University of Pesth, and, after taking priest's orders (1838), in the Vienna Augustinum. As bishop since 1849 of Diakovo (a diocese including Bosnia and Syrmia), he has been the head of the Croatian party in the Vienna *Reichsrath*, and by his statesmanlike strivings for autonomy has incurred the dislike of the imperial government. In Western Europe, however, he is chiefly known as one of the chief opponents of the Infallibility Dogma in the Vatican Council (1870), being one of the 88 who voted 'No.' His speeches there made Dupanloup own him his master in oratory, but their liberal sentiments respecting Protestantism called forth the cry of 'Heretic!' He has passed three winters at Rome since the promulgation of the decree, but has been wisely left to his own beliefs, since his influence over his countrymen has been rendered boundless by a princely liberality, of which his latest instance was his sending £3000 to the Slavonic sufferers in the Russo-Turkish war.

Stroud, a market-town of Gloucestershire, 11¾ miles S.S.E. of Gloucester by rail, lies in a valley sheltered by the Cotswolds, at a point where two streams unite to form the Frome or Stroud Water. It has two churches, St. Lawrence (rebuilt, with exception of the spire, in First Pointed style, 1866–68) and Holy Trinity (1834), an Elizabethan town-hall (restored 1865), a new hospital (1876), a large and handsome building for public meetings called the Subscription Rooms (1830), Temperance Hall (1878), a Corn Hall, Liberal Association Rooms, and Badbrook Conservative Hall. The district is the chief centre of the West of England cloth manufacture, which in 1871 employed 1309 men and 2188 women, and scarlet-dying (employing 43 men) is also a specialty of this valley. S. returns two members to Parliament, and publishes two weekly newspapers. Pop. of parish (1871) 7957; of parliamentary borough, 38,610.

Stru'ensee, Johann Friedrich, Count, the celebrated Danish minister, was born August 5, 1737, at Halle, where he graduated doctor of medicine in 1757. The year after he settled at Altona, and in 1768 he was appointed private physician to Christian VII. of Denmark, over whose counsels he soon gained great influence, and of whose young queen Caroline Mathilde he became an intimate friend. From the fall of the elder Bernstorff (September 13, 1770) S. was the virtual autocrat of Denmark, though for a time content with the simple title of 'Maître des Requêtes.' In July 1771 he was appointed 'Privy Cabinet Minister,' and received the title of Count, with the office of setting forth in written decrees the oral orders of the king. The foreign policy of S. was to make Denmark independent of Russia and an ally of Sweden. At home he freed the press, gave order and economy to finance, abolished torture, and simplified the procedure of law. His freethinking principles provoked the clergy, and his high-handed reforms in agriculture and expenditure enraged the nobles. Even the common people were irritated by his scorn of the Danish speech and nationality, so marked that all decrees and petitions must needs be composed in German. In the night between the 16th and 17th January 1772 he was overthrown by a conspiracy of nobles headed by Juliane Marie, the Queen-Mother. Accused of adultery with the queen and of compassing the kingly power, he was condemned on the 25th and beheaded on the 28th July 1772. See J. K. Köst, *Grev S. og hans Ministerium* (3 vols. Copenh. 1824; improved ed. in German, 2 vols. 1826–27); Jenssen-Tusch (1864). Professor K. Wittich, of Jena, has just completed (October 1878) a biography of S.—**Karl August von S.**, brother of the above, born August 18, 1735, at Halle, from 1769 a counsellor of justice and member of the college of finance at Copenhagen, was after his brother's fall demanded, as a Prussian subject, by Friedrich the Great, by whom he was made director of navigation in 1782, ennobled in 1789, and appointed minister of state in 1791. He died October 17, 1804.

Stru'mous Diath'esis. See TUBERCULOSIS.

Strut, in carpentry, a piece of timber employed to support a rafter. See ROOF.

Strutt, Joseph, painter and engraver, was born at Springfield, Essex, October 27, 1742. When fourteen years of age he was apprenticed to the engraver, W. Wynne Ryland; in 1769 he became a student of the Royal Academy, and in the following year he gained a gold medal for his historical picture, 'Æneas stopped by Creusa.' His attention was turned towards antiquarian investigations by his attendance at the British Museum in 1771; and only two years elapsed before the appearance of his *Regal and Ecclesiastical Antiquities of England from Edward the Conqueror to Henry VIII.*, with 60 plates (new ed. by Planché, 1842). Though he afterwards painted a few historical pieces and engraved a number of paintings by other artists, his energies were almost exclusively devoted to the publication of antiquarian works: *Horda Angel-Cynnan; or, Manners, Customs, &c., of the People of England* (157 plates, 3 vols. 1774–76), *Chronicle of England* (42 plates, 2 vols. 1777–78), *Biographical Dictionary of Engravers* (2 vols. 1785–86), *Dress and Habits of the People of England* (142 plates, 2 vols. 1796–99; new ed. 1875), *Glig-gamena Angel Leod, Sports and Pastimes, &c.* (40 plates, 1801, enlarged by Hone 1830; new ed. 1875). After his death, 16th October 1802, his son published *The Test of Guilt, a Dramatic Tale* (1808), *Bumpkin's Disaster* (1808), and *Queenhoo Hall, a Romance*, and *Ancient Times, a Drama* (4 vols. 1808). *Queenhoo Hall* was completed by Sir Walter Scott.

Stru've, Friedrich Georg Wilhelm von, a celebrated Danish astronomer, was born at Altona, April 15, 1793. After studying at Dorpat University, he entered the observatory in 1813, of which he became director in 1817. In 1834 he was entrusted with the erection of the projected Russian Observatory at Pulkova, and on its completion in 1839 was nominated the

director. Here he continued his researches in sidereal astronomy, cataloguing nebulæ and double stars, and determining parallaxes. He was also intimately connected with the triangulation (1816–19) of Livonia, and with measurement of the arc of the meridian in the Baltic provinces, which he afterwards extended to the North Pole and the Danube in conjunction with Hansteen and General Teuner respectively. His chief works are—*Observationes Dorpatenses* (8 vols. 1817–39), *Catalogus novus Stellarum Duplicium* (1827), *Stellarum Duplicium Mensuræ Micrometricæ* (1837), *Description de l'Observatoire central de Russie* (1845), *Études d'Astronomie Stellaire* (1847), *Stellarum Fixarum, imprimis compositarum Positiones mediæ* (1852), and *Arc du Méridien entre le Danube et la Mer glaciale* (1861). S. died at St. Petersburg, November 23, 1864.—**Otto Wilhelm von S.**, born at Dorpat, May 7, 1819, son of the preceding, succeeded his father as director of the Pulkova Observatory in 1862. His valuable astronomical memoirs appear in the published memoirs of the Academy of Science of St. Petersburg. They include researches into the periods of double stars and of comets, observations of Saturn's rings, and of various nebulæ, and determinations of the mass of Neptune and the parallax of several stars.

Strych'nia, or **Strych'nine**, an exceedingly bitter and poisonous alkaloid ($C_{21}H_{22}N_2O_2$) obtained from *Strychnos nux-vomica*, was discovered by Pelletier and Caventou in 1818. S. is a bitter tonic, and is specially useful in cases where there is general relaxation and loss of nerve-power. S. acts on the spinal motor nerve-centres, and probably on the vaso-motor centres, and also the trophic centres, its special use being in cases of general functional atony and weakness. S. is of great value in cases of *paralysis* dependent upon, or accompanied by, a depressed state of the spinal or other motor nerves; but where there is inflammation and irritation of these nerves it should not be employed. In cases of *hemiplegia* it should not be exhibited until irritation from the clot has ceased. S. is useful also in cases of *lead-poisoning*. The antidotes for S. are chloroform, belladonna, aconite, morphia, tobacco, and hydrate of chloral. See NUX-VOMICA and STRYCHNOS.

Strych'nos, a genus of *Loganiaceæ* (q. v.), comprising trees or climbing shrubs with entire 3–5 nerved leaves, pentamerous, bisexual flowers, tubular or funnel-shaped corolla, valvate lobes, stamens inserted in the throat, fruit a berry with a shell-like rind, and the seeds large, compressed, embedded in a fleshy pulp. The genus is widely spread through the tropics. Species of importance will be found under articles CLEARING NUT, NUX VOMICA, UPAS, and WOORALI. Besides these, *S. Pseudo-quina* of the Brazilian forests yields colpache-bark, largely used in that country for intermittent fevers in place of quinine; its fruit is edible: *S. ligustrina* and other Java species, as also *S. colubrina*, a native of Malabar, are used as remedies for snake-bites; and the fruit pulp of *S. innocua* and *S. spinosa* as an article of food in Africa.

Strype, John, born at Stepney, November 12, 1643, passed from St. Paul's School to Jesus College, Cambridge (1661), but migrated to Catharine Hall, taking his B.A. (1665) and M.A. (1669). For over sixty years he held the living of Low Leyton, Essex, combining with it the lectureship of Hackney, where he died December 11, 1737. Half of his long life S. devoted to the collection of historical materials, his *Memorials of Cranmer* not appearing till 1694. It was followed by Lives of Sir Thomas Smith (1698), Bishop Aylmer (1701), Sir John Cheke (1705), Archbishop Grindal (1710), Archbishop Parker (1711), and Archbishop Whitgift (1718), by *Annals of the Reformation* (4 vols. 1709–31), an enlarged edition of Stowe's *Survey of London* (2 vols. 1720), and by his *magnum opus*, *Ecclesiastical Memorials* (3 vols. 1721), all but the *Survey* collected in the Clarendon Press edition of his works, with a general index (27 vols. 1821–43). Prolix and heavy, the 'colourless' narrative of S. has yet proved, with its faithful transcripts of the most precious documents, a mine to later historians of the Reformation period.

Stu'art, Gilbert Charles, an American portrait-painter, was born at Narragansett, Rhode Island, U.S., in 1756. From Edinburgh, whither he had accompanied a Scotch painter named Alexander, he worked his passage back to America; but on the outbreak of the Revolution he went to London, and there was fortunate enough to find a friend in Benjamin West, whose generosity is still commemorated by his protegé's full-length portrait of him in the National Gallery. In England S. painted portraits of George III., the Prince of Wales, John Kemble, Sir Joshua Reynolds, and other persons of rank, and when he went to France he was permitted to place Louis XVI. on his canvas. Returning to America in 1793, he painted the portrait of Washington, now in the Boston Athenæum. It was followed by portraits of Adams, Jefferson, and a whole host of American celebrities, and the artist was recognised as one of the greatest portrait-painters of his native country. His method was to concentrate all his attention on the face and head, and to let the less important details and accessories take care of themselves. S. died at Boston, 9th July 1828. His daughters, Mrs. Stebbins and Miss Jane S., long followed their father's profession at Boston.

Stu'art, John, LL.D., born at Forgue, Aberdeenshire, in November 1813, studied at the University of Aberdeen, and having passed advocate, was appointed an official searcher of the records in the Edinburgh Register House (1853), and Principal Keeper of the Register of Deeds (1873). His university conferred on him the honorary title of LL.D. (1866), and he was a member of several home and foreign antiquarian societies at the time of his death, which took place at Ambleside, 19th July 1877. A chief promoter of the Spalding Club (1839–70), S. edited for it twelve volumes of records and chronicles, besides the *Sculptured Stones of Scotland* (2 vols. 1856–67), and *Book of Deir* (q. v.). To the proceedings of the Scottish Society of Antiquaries, of which he was secretary from 1854, he contributed the *Records of the Priory of the Isle of May and Records of the Monastery of Kinloss*, and his latest work was *A Lost Chapter in the History of Mary Queen of Scots* (1874), based on his discovery of the dispensation for Bothwell's marriage with Lady Jane Gordon.

Stu'art, Moses, an American theologian, was born at Wilton, Connecticut, 26th March 1780. He was educated at Yale, graduated in 1799, became a tutor at Yale, pastor of a Congregational church at Newhaven, and in 1810 professor of sacred literature in the Andover Theological Seminary. This post he retained until 1848, when he resigned it owing to ill-health. He died at Andover, 4th January 1852. His principal works are his Hebrew and Greek grammars, and his Commentaries on the Epistle to the Hebrews (1827), Epistle to the Romans (1832), Apocalypse (1845), Daniel (1851), Ecclesiastes (1851), Proverbs (1852), as well as a *Critical Defence of the Old Testament Canon* (1845). S. ranks as one of the best and most erudite of American divines.

Stubbs, William, born at Knaresborough, 21st June 1825, proceeded from Ripon grammar-school to Christ Church, Oxford, where, having taken a first in classics and third in mathematics, he was elected fellow of Trinity. Ordained in 1848, he became vicar of Navestock, Essex (1850), Regius Professor of Modern History at Oxford (1866), fellow of Oriel (1867), curator of the Bodleian (1869), and rector of Cholderton, Wilts (1875). In the prefaces to the six important works that he has edited for the Rolls Commission, S. showed his thorough mastery of the Angevin period, these being *Chronicles and Memorials of the Reign of Richard I.* (2 vols. 1864–65), *Gesta Regis Henrici II. Benedicti Abbatis* (2 vols. 1867), *Chronica Magistri Rogeri de Houedene* (4 vols. 1868–71), *Memoriale Fratris Walteri de Coventria* (2 vols. 1872–73), *Memorials of St. Dunstan* (1874), and *Radulphi de Diceto Opera Historica* (2 vols. 1876). His *Early Plantagenets* (Lond. 1876) gives a short, lucid summary of the same period. But the *Constitutional History of England* (vols. i.–iii. Oxf. Clar. Press, 1874–78) has a far wider scope. Combining the latest results of foreign investigation with his own vast researches, he here traces the growth of the English commonwealth through all its stages with a power, insight, and calmness that rank his work among the masterpieces of history. He has also published *Hymnale secundum Usum Sacrum* (1850), *Tractatus de Sancta Cruce de Waltham* (1860), *Select Charters and other Illustrations of English Constitutional History* (1870), &c., and is a member of various learned societies at home and on the Continent.

Stucc'o (Ital.), a technical term for several kinds of plaster composed of fine lime and clean sand; also a composition of plaster-of-Paris and fine glue, used for ceiling decorations, &c.

Stuff'ing is a solid seasoning placed within fowls, game, &c., previous to cooking the food, in order to increase its flavour. It consists usually of flour or bread-crumb and eggs, seasoned with onions, savoury herbs, and spices.

Stuff'ing and Preser'ving An'imals. See TAXIDERMY.

Stuhlweiss'enburg (Hung. *Székes-Fehérvár*, Slav. *Bialigrad*), an historic town of Hungary, situated in a swampy district near the marshes of Sár-Rét, 42½ miles S.W. of Pesth by rail. The chief buildings are the cathedral and the church of St. Maria, built by Stephen I., the place of crowning and burial. S. was the residence of the Hungarian kings from 1027 to 1527, when Bela IV. removed to Ofen. S. manufactures cloth, flannel, cordovan, and knives, and has an important traffic in wool, corn, wine, and live stock. Pop. (1869) 22,683. S. is believed to occupy the site of the Roman *Floriana*. It was held by the Turks at intervals from 1545 to 1688.

Stuke'ley, William, M.D., F.R.S., an antiquary of considerable repute, was born at Holbeach, Lincolnshire, November 7, 1687. In 1703 he entered at Corpus Christi College, Cambridge, whence he graduated M.B. in 1709. After residing for a time at Boston, he betook himself to London in 1717, where he was admitted fellow of the College of Physicians. In 1726 he retired to Grantham, in his native county, where he acquired a good practice, which, however, he abandoned three years afterwards for the Church, being presented to the living of All Saints', Stamford. In 1747 the Duke of Montague gave him the rectory of St. George the Martyr, Queen Square, where he died, March 3, 1765. S.'s antiquarian works are more voluminous than valuable; the best known are *Itinerarium Curiosum; or an Account of the Antiquities and Curiosities of Great Britain* (2 vols. 1724); *An Account of Stonehenge* (1740); and *Palæographia Britannica* (1743-52). S., who was known among his friends as the 'Arch-Druid,' was a credulous and fanciful speculator.

Stu'pa. See TOPE.

Stur'dy or **Gid**, an affection of sheep, identical with *Staggers* (q. v.).

Stur'geon (*Sturio* or *Accipenser*), a genus of *Ganoid* (q. v.) fishes belonging to the *Placoganoid* section of that group. The spine is represented by imperfect ossifications, the *notochord* being retained. The tail is *heterocercal*, or unequally lobed. The S. is a typical fish of the northern hemisphere. It ascends rivers for the purpose of spawning. No teeth are developed, the mouth is curiously placed on the under surface of the head, and at the extremity of a proboscis. The S. is of high commercial importance. From its air-bladder or sound *isinglass* is obtained, the flesh is valuable, and the delicacy known as *caviare* is obtained from the roe. The *Accipenser sturio* is the common S. not unfrequently captured on British coasts, and esteemed a 'royal' fish when passing into the Thames, belonging by hereditary right to the sovereign. Its average length is 6 feet. The Beluga (*A. huso*) is a very large species, which may measure from 12 to 20 feet in length. It occurs in the Black Sea, Caspian, &c., and may weigh 3000 lbs. The sterlet (*A. Ruthenus*) a smaller species, attaining a length of 3 feet, is valued for the delicacy of its flesh.

Stutt'gart (local pron. *Stukkert*), the capital of Würtemberg, is situated in the midst of vine-covered hills on the main Bruchsal-Friedrichshafen line of the Würtemberg State railway. The greater part of S. dates only from this century, the quickening of German national life since 1813 having had a powerful effect upon it, and the Stiftskirche and Altschloss are almost the only ancient buildings remaining. Near the centre of the town is the Schloss Platz, laid out in pleasure-grounds, and adorned with a column of blue-grey granite 59 feet high, erected in 1841 in honour of King Wilhelm I., on the pedestal of which are various allegorical figures. The whole of one side of the Schloss Platz is occupied by the new palace, a magnificent building begun in 1746 and completed in 1807, said to contain 365 apartments. Adjoining this, on the S. of the Schloss Platz, is the Altschloss (1553-70) containing rich art treasures, and in the centre of the inner court an equestrian statue of Count Eberhard of Würtemberg (died 1496). Other important buildings are the Stiftskirche, already mentioned, in Gothic style, built between 1436 and 1495, but with towers still unfinished, containing many fine sculptures; the Königsbau (1555-60), comprising a concert-hall, assembly rooms, cafes, &c.; a new English church and a magnificent synagogue; the Cabinet of Natural History; the Museum of Art, in which is a valuable collection of Thorwaldsen's works; the Baugewerkeschule, where (1877) 644 students receive instruction from 36 teachers; and the Royal Library, containing 300,000 vols., including 3600 MSS. and 2400 specimens of early printing. The statue of Schiller in the Schiller Platz (1839) also deserves mention, and the Anlagen, extensive pleasure-grounds stretching from the Schloss nearly to Cannstatt, a distance of 2 miles. Among the industries of S., cabinetmaking, sugar-refining, and brewing are important; but the town is chiefly noted as a centre of the South German book trade. The neighbourhood is celebrated for its wine and orchard produce. Pop. (1875) 107,573.

Stuy'vesant, Peter, born in Holland in 1602, entered the Dutch service, and as director of the colony of Curaçoa lost a leg in the attack on the Portuguese island of St. Martin. Appointed director-general of the New Netherlands (1647), he concluded peace with the Indians, in 1650 settled the boundaries of the English and Dutch possession, and in 1655 annexed New Sweden on the Delaware. His refusal to admit the protest of a convention (1653) against the revival of obsolete statutes had roused a widespread discontent; and when in 1664 an English fleet appeared before New Amsterdam demanding its surrender, he found himself abandoned by his subordinates, and on 3d September the town was given up to the English, who changed its name to New York (q. v.). S. next year repaired to Holland to give an account of his conduct, but soon returned, and down to his death in August 1682 lived at his farm, the Bowery, on the site of the present Bowery Street.

Stye. See HORDEOLUM.

Style, Old and New. See CALENDAR.

Styli'tes. See PILLAR-SAINTS.

Styp'tics (Gr. *styptikos*, 'astringent') are medicines which arrest bleeding, chiefly used in hæmorrhage from the nose, gums, vagina, and rectum. The more important S. are acetic, gallic, and tannic acids; alum, cinchona, sulphate of copper, ergot, perchloride of iron, pomegranate root, tincture of red gum, and matico.

Styr'ia (Ger. *Steiermark* or *Steyermark*), a duchy of Austro-Hungary, surrounded by the archduchy of Austria, Hungary, Croatia, Carniola, Carinthia, and Salzburg. Area, 8669 sq. miles; pop. (1870) 1,137,990, (707,000 Germans chiefly in the north, 410,000 Slavs in the south). S. is very mountainous in the N. and W., crossed by three chains of the Noric Alps, of which Thorstein rises to 10,649 feet, and Hochgolling to 9594 feet; in the E. and S. it is hilly, with fruitful plains and valleys, above which the Bachergebirge rises to a height of 5005 feet. The chief rivers are the Mur, Drave, and Save. There are few lakes, but numerous mineral springs (mostly acidulous), of which Rohitch and Gleichenberg are the most noted. About 45 per cent. of the surface is forest, 22 per cent. arable land, producing rye, wheat, maize, fruit, and wine. The chief industries are horse and cattle breeding, coal and iron mining (especially in the N.), and the manufacture of iron and steel ware, chiefly sickles, household utensils, and cast-iron goods. In 1876 the iron ore produced in S. amounted to 2,809,381 metric cwts. (in 1873 to 4,701,252). Trade is actively carried on by the Vienna-Trieste railway and its various branches. S. has a university and mercantile academy in Gratz, three *gymnasien*, five *Realschulen*, and 729 *Volksschulen*. It is represented in the Reichstag by 13 deputies. S., an imperial markgrafdom from 955, was given as a fief to the Bavarian Graf Ottokar by Otto I. Ottokar VI., made a duke in 1180, dying childless (1192), bequeathed S. to his father-in-law, Leopold V., Duke of Austria. After many struggles it came to Ottokar II. Przemysl, King of Bohemia, in 1253. He falling (1278) in battle with Rudolf of Hapsburg, the latter in 1283 enfeoffed his son Albrecht in S. It has ever since belonged to the Hapsburgs, and followed the fortunes of Austria. See Muchar, *Geschichte des Herzogthums S.* (7 vols. Gratz 1844 *et seq.*); Gebler, *Geschichte des Herzogthums S.* (Gratz 1862); and *Beiträge zur Kunde Steiermärk. Geschichtsquellen* (published by the Historical Society of Gratz, 1864).

Styx (Gr. *stygein*, 'to hate;' mod. names *ta Mauvaneria*, or *ta Drakoneria*, 'black' or 'terrible waters'), a streamlet in the N. of Arcadia, Greece, rising near Nonacris. It falls over a high precipice, among wild scenery, and flows to the Crathis. It is the highest cascade in Greece. The ancients thought its waters poisonous, and the superstition remains. It is described by Homer (*Il.* xv. 36). Pausanias gives the fullest account, but almost all Greek writers refer to it. To the Greek and Latin poets it suggested the famous river of Hades. A branch of Oceanus, this sluggish river, or 'stygian pool' as it was sometimes called, flowed seven times round hell. Souls of the dead were ferried over it by Charon to Tartarus. The gods swore by S. their most solemn oaths. Personified, S. was a goddess, daughter of Oceanus and Tethy, and dwelling in a grotto at the entrance to Hades. The S. was a prominent feature in the nether world of mediæval as well as classical cosmology. Dante met it in the third round of the seventh circle of hell. Virgil told him its source was in Crete.

Sua'bia. See SCHWABEN.

Sua'kin, an Egyptian port on the Red Sea, built on a coral island 100 yards from the shore, and has a good harbour. Being the port of the caravan route from Berber, on the Nile, S. has an active trade, chiefly in gum and ivory. Pop. 8000.

Suar'ez, Francisco, a celebrated Roman Catholic theologian, born at Granada, 5th January 1548, and studied at the University of Salamanca. The preaching of the Jesuit Ramirez in 1565 determined him to enter the Church. So little promise did he give of his subsequent pre-eminence, that the Order of Jesus nearly refused him admittance into their ranks, but the accomplished rector of Salamanca, Gutierrez, discovering their mistake, encouraged him to place himself under the celebrated Rodriguez at Monterey, where he made such rapid progress that he was soon called upon to fill the office of teacher himself, first at Segovia, and then successively at Valladolid, Rome, Alcala, and Salamanca. Philip II. appointed him professor of theology in his newly-founded University of Coimbra, a chair which he filled till his death with the greatest distinction, being described by his contemporaries as 'alter Augustinus,' 'hujus ætatis prodigium et oraculum.' He died 25th September 1617. His works were published in 23 folio vols. in Lyon and Mainz in 1630 and following years. In 1861 a new edition in 28 vols. was completed at Paris. In theology S. is chiefly known as an exponent of Molinism; in philosophy he followed Aristotle, his commentaries upon whom were long used as a text-book even in Protestant colleges. His own Church described him as 'oculus populi Christiani sed suo judicio nihil.' See his *Life*, by Deschamps (in Latin, Lisb. 1671); also Werner, *S. und die Scholastik der letzten Jahrhundert* (1861).

Súbahdár (from an Arabic word meaning 'province' or 'government'), applied in India to a viceroy under the old Mogul dynasty, and also to a native officer in the Sepoy army who holds a rank corresponding to that of captain.

Sub'altern, in the army, a commissioned officer (lieutenant or sub-lieutenant) below the rank of captain.

Subia'co (anc. *Sublaqueum*), a town of Central Italy, province of Rome, on the Teverone, 19 miles E. of Tivoli. It has a mediæval appearance, and is commanded by an old castle, in former times often occupied by the Popes. It has three monasteries of S. Scolastica, the first founded in 530 by St. Benedict, the second in 1052, and the third in 1235. Pop. (1874) 6990.

Sub'ject. See OBJECT.

Sublapsa'rian (Lat. *sub*, 'after,' and *lapsus*, the 'Fall') is the name applied to a certain view of Predestination (q. v.), which regards the decree of God permitting man to fall as coming before the decree to elect certain out of the fallen race to eternal life, and to pass others by. According to the Supralapsarian (Lat. *supra*, 'before,' and *lapsus*) theory, to which it is opposed, God first decreed the salvation of some and the damnation of others, and then decreed to create those already elected or reprobated, and to permit them to fall.

Sublieuten'ant, a junior rank of commissioned combatant officers in the army and navy. Formerly this title was confined in the army to officers in the royal regiment of artillery and the fusiliers, in which there were no ensigns. Since 1871 it has superseded the rank of ensigns in all regiments. A cadet becomes a S. in the army after passing the prescribed examinations before the Civil Service Commissioners, provided a vacancy permits his being at once gazetted. In the navy, a midshipman becomes a S. after 5 or more years' service. The pay of a S. or 'second lieutenant' in the army is from 5s. 3d. per day in the infantry to 8s. in the cavalry, and 5s. per day in the navy.

Sublima'tion, in chemistry, is a process by which matter converted from the solid into the gaseous state by heat is reconensed into the solid condition by contact with a cold surface. It is applicable only to comparatively few substances, such as sulphur, iodine, arsenious acid, benzoic acid, &c., which may be purified by this treatment. Hoar frost is a well-known example of S., being the condensation into the solid form of the water-vapour of the atmosphere without passing through the intermediate liquid condition.

Sub'marine For'ests, the name given to submerged recent beds of peat, containing the roots and stems of trees in the very positions in which they originally grew. They are not uncommon round the British coasts.

Sub'ordinaries, in heraldry, a class of devices inferior to, and less simple than, the Honourable Ordinaries (q. v.). They are usually held to be sixteen in number; the canton, gyron, inescutcheon, orle, tressure, lozenge, fusil, frette, flanch, mascle, rustre, label, billet, bordure, pile, and flasque.

Suborna'tion. See PERJURY and SUBORNATION.

Subpœ'na is a writ by which the attendance of a witness in court is made compulsory. A witness is allowed travelling expenses, but usually no further remuneration.

Sub Ro'sa ('under the rose,' *i.e.*, under the obligation of secrecy), a term which possibly had its origin, as Sir Thomas Browne suggests, in the closeness with which the rosebud folds its petals, or in the rose with which Harpocrates, god of silence, was bribed by Cupid not to divulge his mother Venus's amours. A rose is often found sculptured on the ceilings of medieval banqueting halls and on confessionals of the 16th c.

Sub'sidies (Lat. *subsidium*, 'an aid'), a term formerly used to denote extraordinary grants made to the king by Parliament for the defence of the nation by sea and land; now almost solely to designate supplies given by one power to another to assist it in the prosecution of a war. S. in their original sense included not only extraordinary supplies, but permanent grants. Taxes on land and goods, and extra custom-duties, were the usual means of raising S. In modern history there have been innumerable instances in which S., in the later sense of the word, have been granted by one nation to another; *e.g.*, in the wars succeeding the French Revolution, Britain subsidised most of the powers which resisted the French arms, 'the gold of the monster Pitt' becoming a proverb in Paris. A nation supplying S. has generally been held to constitute itself a belligerent.

Sub'stance (Lat. *substans*, 'standing under') is a philosophical term meaning the real and permanent element which lies under the deceptive and transitory forms (phenomena) of existence. This definition, however, is only approximate, for each system of philosophy gives, in accordance with its own tenets, a special meaning to and explanation of the term.

Substantia'lia, a disused term in law meaning the same as Essentials. See ERROR IN ESSENTIALS.

Sub'stitute, in a military sense, one who serves in an army in the place of a conscript for a consideration. In most continental countries, where military service is compulsory, many old soldiers who have served their time, but are still eligible for the army, are found ready to undertake this duty.

Substitu'tion is a theological term employed to express the exact nature of what Christ did for the sinner according to the prevalent theory of the Atonement (q. v.). The doctrine of S. teaches that the sufferings of Christ were not merely like those of martyrs, patriots, &c.—endured for the good of others, but were strictly vicarious. He suffered in the room and stead of sinners,

satisfying in his own person all the demands which the law could justly make upon them.

Subtrac'tion, in arithmetic, is the operation of finding the difference between one number and another, the less being *subtracted* from the greater. In algebra the operation is included under addition, the rule for S. being *change the sign and add*. Here there is no convention as to which quantity must be the greater; the algebraic *sign* of the remainder removes any possible ambiguity.

Sub'way is a term applied to an accessible underground passage containing gas and water mains, telegraph wires and sewers, all of which may be readily examined, altered, or repaired as required, without disturbing the street surface and obstructing traffic. Williams of London suggested this plan in 1822, and it has been carried out in the metropolis, Paris, and other large cities. The advantages of subways are so manifest that it is a wonder they are not more widely adopted by all large and wealthy centres, where the expense, certainly great, attending their construction can be no bar. Holborn Viaduct in London has a S. under both of the footways and over the sewer tunnels. The subways are arched, lined with brick, and floored with stone. They are 11½ feet high, and 7 feet wide. Along the bottom of one of the side walls the water-main is laid, and over it on brackets are carried two gas-mains; on the opposite side, at the spring of the arch, the telegraph pipe rests on another set of brackets, and on the floor beneath rails are laid for a travelling crane, by means of which alteration and removal of pipes are greatly facilitated. Openings occur along the sides for the passage of gas and water service-pipes into the houses, and in the arch connections are made with the street hydrants and gas-lamps. Good ventilation for the S. is provided by grated openings in the footway, and by flues leading to the external air through the party-walls of the houses. Ventilating gullies are also furnished for the sewer-channels beneath the subways.

Succes'sion, in Scotch law, means the taking of property by one in place of another. In heritage (see HERITABLE AND MOVABLE) or real estate, Scotch law gives the preference to descendants, giving the S. to the eldest son, and failing him or his issue to the next eldest son, and so on. Failing sons, daughters succeed as Heirs Portioners (q. v.). When there are no descendants, collaterals (see COLLATERAL SUCCESSION) succeed. Thus, the brothers and sisters of the deceased succeed (see BROTHERS, LAW OF SUCCESSION AMONG). If neither descendants nor collaterals exist, the S. ascends, and the father succeeds, but the mother is excluded. Failing the father, his brothers and sisters succeed in their order, and failing them the paternal grandfather and his collateral line, so far as relationship can be traced, failing proof of which the Crown succeeds as *Ultimus Hæres*. Regarding succession to movable estate in Scotland, see EXECUTORS and COLLATION. For the laws of England and of Scotland, see INTESTACY, HEIR, and references in these articles.

Succes'sion Act. See ACT OF SETTLEMENT.

Succes'sion Du'ties. These are imperial taxes on legacies, and on succession to real estate. To any lineal descendant or ancestor of the deceased the duties are £1 per cent.; to a brother, sister, or their descendants £3 per cent.; to an uncle, aunt, or their descendants, £5 per cent.; to a great-uncle or great-aunt, or their descendants, £6 per cent.; to any other person £10 per cent., except in case of a legacy between husband and wife, which is exempt from duty. When the total value of an estate is under £100 there is no S. D., nor is there on any share under the value of £20. S. D. is a first charge on property.

Success'ion Wars, three wars of the first half of the 18th c. (1.) The **Spanish S. W.** (1700-14). The succession to Carlos II. of Spain in 1700 was disputed by Philippe of Anjou and the Austrian Archduke Karl, supported by Holland and England. Philippe was backed by France, with the Electors of Baiern and Köln, and by Savoy and Portugal till 1703. In Spain he gained the victories of Almanza (1707) and Villa Viciosa (1710); but from Germany the French were driven back by the victory of Marlborough at Blenheim (1704), from Italy by Eugene's victory of Turin (1706), and from the Spanish Netherlands by their defeats at Ramillies (1706), Oudenarde (1708), and Malplaquet (1709). The fall of Marlborough and the War Party in England (1710), and the succession of Karl to the German Empire, hastened the Peace of Utrecht (1710), which gave the succession to Philippe as Felipe V., the Spanish Netherlands; Milan, Naples, and Sardinia to Karl VI.; Sicily to the Duke of Savoy; Gibraltar, Minorca, and French North America to England. With these terms Karl VI. coincided at the Peace of Rastatt and Baden (1714).—(2.) The **Polish S. W.** (1733-35). See POLAND.—(3.) The **Austrian S. W.** (1740-48) was waged for the Austrian possessions after the dying out of the Hapsburg male line with the Emperor Karl VI. (20th October 1740). In spite of the Pragmatic Sanction (q. v.), Friedrich II. (q. v.) of Prussia laid claim to 4 Silesian principalities, and began the *First Silesian War* (1740-42), in which Baiern, Sachsen, Spain, Sardinia, and France combined to crush Maria Theresa (q. v.), who yet maintained her position with the support of her Hungarians till English influence brought Friedrich to the Peace of Breslau (1742). In 1743 Sachsen and Sardinia passed over to the side of Austria, George II. defeated the French at Dettingen, and Karl Albrecht (from 1742 Emperor Karl VII.) was driven from Baiern. The Austrians advancing on Elsass, Friedrich broke the Peace of Breslau, and began the *Second Silesian War* (1744), which ended with the Peace of Dresden (1745). The same year Moritz (q. v.) of Sachsen defeated the English and Austrians at Fontenoy, and with the victories of Raucoux in 1746 and Lafeld in 1747 he won the Austrian Netherlands for France. But France was exhausted with the marine and colonial war with England; for English gold a Russian army passed forward to the Rhine; and Maria Theresa, while yielding at the Peace of Aachen (1748) Parma and Piacenza to the Spanish prince Felipe, Schlesien to Prussia, and part of Lombardy to Sardinia, was able to keep all the rest of her inheritance and obtain the recognition of her husband Franz Stephan as Emperor of Germany.

Succin'ic Acid ($C_4H_6O_4$), one of the series of diabasic fatty acids of which oxalic acid ($C_2H_2O_4$) is the first member, is obtained by digesting amber (*succinum*) with alkalies. It is also found in the resins of coniferous trees and in the leaves of wormwood, and has been identified in the urine of dogs and rabbits. It may be made to take up oxygen and become converted into tartaric acid ($C_4H_6O_6$), which in its turn may be deoxidised and converted into S. A.

Succ'ulent Plants, a general name for those flowering plants that are naturally very cellular and juicy. Most of such belong to what is called the Xerophilous group—*i.e.*, plants that can thrive in climates in which the air contains habitually very little moisture. To flourish under these circumstances the concomitants are various. In Dicotyledons—1st, The leaves becoming thick and fleshy, with inner and leathery outer layers, in which the air-passages and stomata are few, and the cells either small or their walls thickened by secondary deposits of cellulose, as shown in *Mesembryanthemum*, *Sedum*, *Cotyledon*, and *Sempervivum*; 2d, The stem condensed into a single, central, unbranched, barrel-shaped or top-shaped mass, which is leafless and armed only with spines, as in *Echinocactus*, *Mammillaria*, and various *Euphorbiæ*, or without spines and bearing fleshy or rigid leaves, as in *Cycads*, *Welwitschia*, and some species of *Vitis*; 3d, Branching fleshy stems, which put on a somewhat leafy appearance, but without proper leaves, as in *Opuntia* and *Phyllocactus*. In Monocotyledons we have two characteristic forms—1st, The large, thick, fleshy-leaved type, as illustrated by *Aloe*, *Gasteria*, *Fourcroya*, *Agave*, and *Bulbine*; and, 2d, The familiar bulb type, as hyacinths, lilies, &c., which push up a flower in a brief season of fertility, and spend the rest of the year in the form of an underground mass of dry or fleshy leaf-scales. The object of cultivation is frequently to develop cellulose tissue, thereby imparting succulency. Of this we have examples in many of the edible fruits, and in such garden plants as the celery, the lettuce, the turnip, and the carrot, the originals of which are hard, stringy, and worthless for food purposes.

Su'chet, Louis Gabriel, Duc d'Albufera, Marshal of France, was born at Lyon 2d March 1770. He volunteered (1792) into the cavalry division of the National Guard of Lyon, and served as a captain at the siege of Toulon (1793). His

battalion was then drafted into the Army of Italy, where he distinguished himself at the battles of Lodi, Rivoli, Castiglione, and Arcola. In 1798 he served with distinction in Switzerland, and obtained the rank of general of brigade. He was next entrusted with the reorganisation of the army of Italy, became general of division (1799), and served brilliantly under Joubert and Massena, his defence of the Pont de Var with 6000 men against Melas at the head of 40,000 Austrians being a really great feat. In the campaign of 1800-1 he took part in the battles of the Mincio, Verona, and Montebello, and at Ulm and Austerlitz (1805) and Jena (1806) he rendered effective service. Appointed (1809) generalissimo of the army of Aragon, in two years he entirely subdued the province. Made a marshal in 1811, he undertook and carried out the conquest of the kingdom of Valencia, and was rewarded in the succeeding year with the title of Duc d'Albufera. In 1813 S. took the command of the united armies of Aragon and Catalonia, but was unable to make head against the allies, and was forced to relinquish his conquests and retire to the frontier. Though made a peer of France by Louis XVIII., he took part with Napoleon on his return from Elba, and was entrusted with the defence of the Savoy frontier. After the battle of Waterloo he lost his peerage, but recovered it in 1819. He died at the Château of St. Joseph, near Marseilles, 3d January 1826. Napoleon is related to have said that if he had had two generals such as S. in Spain he would never have lost it, 'but unfortunately,' he added, '*les souverains ne peuvent pas improviser des hommes comme celui-là.*' The sole literary work of S. is his *Mémoires sur ses Campagnes en Espagne* (Par. 1829-34).

Suck'er or **Sucking Fish**, names given to various *Teleostean* fishes from their habit of attaching themselves by the mouth or by special structures to fixed objects. The *Remora* (q. v.) is one of the most familiar sucking fishes; as also is the Lump Sucker (q. v.) or Cock Paidle of the Scotch. The name S. F. has also been given to species of the genus *Liparus*, of which *L. vulgaris*, the common sea sucker or sea snail, is a familiar species; Montague's Sucker (*L. Montagui*) is another well-known member of the group. The S. F. attains an average length of 3 or 4 inches.

Suck'ling, Sir John, an English poet and Cavalier, was the son of Sir John Suckling of Whitton, near Twickenham, and was born in 1609 in his father's house, at a later date the property of Sir Godfrey Kneller. The elder Sir John was comptroller of the household to James I. and Charles I., and twice represented the city of Norwich in Parliament. His son was sent first, it is believed, to Westminster, and then to Trinity College, Cambridge; and according to the older accounts he displayed unusual precocity; but much of the marvel is owing to a confusion of dates, by which he was reckoned four years younger than he actually was. The comptroller died in 1627, and in 1628 his son set out to travel on the Continent. In 1631 he joined the English forces sent to assist Gustavus Adolphus. Returning to London in the following year, he at first led a gay, reckless life about town, and became notorious as a gambler; but he gradually acquired greater sobriety of conduct, and was the friend of Boyle, Davenant, and other men of mark and merit. In 1639 he spent £12,000 in equipping and maintaining a troop of 100 horse for the king's expedition to Scotland. As member for Bramber he took part in the debates of the Long Parliament; but on the discovery of the plot of 1641 for the release of Strafford he was accused of treason, and took refuge in Paris, where he died 7th May 1641. Two accounts are given of his death: according to one he perished from the results of an accidental wound, but according to another, which is supported by family tradition, he committed suicide by poison. Sir John Suckling's only but sufficient claim to a permanent place in our literature is a few felicitous lyrics, of which the best known are 'Why so pale and wan, fond lover?' and the ballad upon the wedding of his friend Roger Boyle with Lady Margaret Howard—'I'll tell thee, Dick, where I have been.' After his death his memory was attacked by the Puritan party in ballads and broadsheets. His poems and letters appeared as *Fragmenta Aurea*, London 1646 and 1648; his *Last Remains* were published in 1659; Tonson printed his collected works in 1709 and in 1719; and another edition followed in 1770. In 1836 Rev. Alfred Suckling published *Selections* with a Life of Sir John, which is still the chief authority. A complete unemasculated edition was edited by Hazlitt (2 vols. Lond. 1875). See a paper on S. in *Gentlemen's Magazine* for October 1878.

Sucto'ria, a term employed in zoology (1) to indicate a division of *Infusoria* (q. v.), in which the cilia are provided with sucker-like tips; and (2) an order of *Annelides* (q. v.) or worms, represented by the leeches, &c., in which one or two sucking-discs are developed.

Sudam'ina, or **Mil'iary Ves'icles**, are small, round, prominent vesicles, about equal in size to millet seeds. The disorder is accompanied with profuse sweating in the course of certain fevers, and is apparently the result of obstruction of the sweat-ducts, and hence the term S. From the size which they usually present—namely, that of a millet seed—they are sometimes designated M. V. S. often occur in the summer months, in children or adults with very tender skin, in eruptive, simple, remittent, and enteric fevers, and in inflammatory affections. The *treatment* of S. applies to the fever which they accompany. A cool temperature and cooling regimen are the most appropriate measures for the treatment of S.

Sudan', a region of Africa, between the Sahara on the N., Senegambia on the W., Upper Guinea and the parallel of 8° N. lat. on the S., and the Nile region on the E. Its area is estimated at 2,250,000 sq. miles, and its pop. at 40,000,000 or 50,000,000. The S. has for ages been the seat of the Negro race, and most of its inhabitants are now Mohammedans. It may be divided into three large regions, the most westerly of which is drained by the Niger, while the central one forms the basin of Lake Tchad, and the eastern one drains off to the Nile. The leading features and products of the S. are mentioned under the names of the principal states into which it is divided, viz.:—Bambarra, Gondo, Sókoto, Bornu, Baghirmi, Wadaï, and Dar Fur. The last named, and the districts of Kordofan, Sennaar, and part of Lower Nubia on the right bank of the Nile, are now commonly called the Egyptian S.

Sud'bury, a market-town of Suffolk, on the Stour, 16 miles S. of Bury by rail, has three ancient churches, All Saints' (restored 1856), St. Peter's, and St. Gregory's (restored 1860-77). Other buildings are the town-hall, corn exchange (1841), St. Leonard's Hospital (1869), the girls' school (1873), and a free grammar-school (founded 1492; rebuilt 1857). In 1871 straw-plaiting employed 1042 persons; the hair and bristle manufacture 3026; and silk, velvet, farm implements, bricks, &c., are also made here. S. publishes one weekly newspaper. Pop. (1871) 6908. Flemings in the reign of Edward III. established the woollen manufacture at S., and it was the birthplace of Archbishop Theobald (beheaded by Wat Tyler's followers 1381) and of the painter Gainsborough.

Sude'ten Gebir'ge, a range of mountains in Germany running N.W. and S.E. for 120 miles, and separating Bohemia and Moravia from Saxony and Silesia. It comprises numerous diversified mountain-masses which can only be roughly classified here. 1. The S.E. portion—S. proper, or *Gesenke*—extending from the Upper Oder to the sources of the March, and comprised wholly within Moravia and Austrian Silesia. The highest summit of this portion is Altvater (4880 feet high). 2. The Glatzer-Gebirgsland, including the Schneeberg Reichensteiner-Gebirge, Eulen-Zobten, Habelschwerter, Erlitzer-Gebirge, and the Friedländer and Waldenburger Highlands. 3. The district of the Riesen-Gebirge (q. v.), Iser-Gebirge, and Lausitzer-Gebirge, with their spurs diverging into Schlesien. This part contains Schneekoppe (q. v.), the culminating point of the whole range. The rocks of the Sudeten mountains, which are very varied, consist mainly of granite and schist, chalk and sandstone. They are rich in iron, copper, and zinc ores, and contain a little of the precious metals.

Su'dra (from a Sanskrit word signifying 'pure'), the fourth and lowest of the Hindu castes, according to the social organisation of Menu. Theoretically the Sûdras should be altogether slaves, born only to serve and support the Brahmins. But as a matter of fact, as the name is now applied indiscriminately to all Hindus who are not either Brahmins or Rajputs, the different sub-castes have attained to varying degrées of purity. In Bengal there are nine acknowledged S. castes of equal rank, called

Nabasaks, who owe their purity to the circumstance that their several occupations can be traced back to the traditional period. See also CASTES and HINDUISM.

Sue, Joseph Marie, usually called **Eugène,** a French novelist, was born at Paris, December 10, 1804. As military surgeon he served in the Spanish campaign of 1823, and was present at the battle of Navarino in 1828; but the fortune worth about £1600 a year which he inherited from his father enabling him to give up his profession, he finally devoted himself to literature, and before long secured a wide popularity as a novelist. Elected a member of the Legislative Assembly in April 1850, he was expelled from France by the *coup d'état* of the 2d December; but in Savoy, whither he retired, he maintained the same literary activity. S. died at Annecy, 3d August 1857. His best-known works are *Les Mystères de Paris* (10 vols. 1842), and *Le Juif-Errant* (10 vols. 1844-45), both of which have run through countless editions, and have been translated into most of the civilised languages. The complete German translations of S.'s novels reach 114 vols. In *Kernock le Pirate* (1830), his first success, *Atar Gall* (1831), and several other works, he depicts seafaring life; in *Les Sept Péchés Capitaux* (16 vols. 1847-49) he illustrates certain principles of Fourierism; and in many of his other romances he deals with different social questions. *Les Mystères du Peuple ou Histoire d'une Famille à travers les Ages* (16 vols. 1849), was condemned as immoral and seditious by the Court of Assize at Paris. So imperfect and misleading did the members of the naval profession consider his *Hist. de la Marine Française* (5 vols. 1835-37), that they presented him with a medal for 'the history which he had not written.' As a novelist he is second to none in the invention of incident and perpetual renewal of the reader's curiosity.

Sue'ca, a town of Spain, province of Valencia, on the N. bank of the Jucar, 4 miles from its mouth, on the Mediterranean, and 9 E.N.E. of Alcira, on the Valencia and Alicante railway. It has industries in rice, flour, tiles, bricks, &c., and carries on some trade through its port, Cullera. Pop. 11,340.

Su'et (Old Fr. *sieu*, Ital. *sevo*, from Lat. *sebum*, 'tallow,' 'suet'), the pure solid fat which occurs in almost detached masses within the loins of the ox and sheep kind. Mutton S. is more solid and contains more stearin and less palmitin than beef S. S. is universally employed in cookery; and mutton S. is used in the preparation of ointments, plasters, &c.

Medicinal Properties of S.—The S. of the Pharmacopœia is obtained from the internal fat of the abdomen of the sheep, and is prepared by melting and straining.

Sueto'nius Tranquill'us, Caius, lived and wrote between 75 A.D. and 160 A.D. His father was S. Lenis, a tribune of the 13th legion under Otho. S., mainly known to us as a biographer and miscellaneous writer, was educated for the Roman bar. He seems never to have sought public employment, and even when he was offered the post of military tribune, he requested his friend Pliny to secure it for a relative. Pliny speaks in high terms of the writings of S., extols his integrity and learning, and says the more he knew him the more he liked him. S. was married, but, so far as is known, had no children. Nevertheless he obtained, through Pliny's interest, from the Emperor Trajan the *jus trium liberorum*, a distinguished privilege, and attainable in such case only by great interest. S. filled the office of *Magister Epistolarum* to Hadrian, a position which gave him vast opportunities for seeing and utilising many important imperial documents. The date of his death is unknown. S. was a voluminous writer. His works, in part enumerated by Suidas, consisted of grammatical treatises and works antiquarian, legal, moral, and biographical, most of which have been lost. His *Lives of the Twelve Cæsars, Lives of Eminent Grammarians*, and a portion of *Lives of Eminent Rhetoricians*, survive. On the first his reputation rests. It is pregnant with interest, replete with curious information and endless anecdote and scandal bearing on the imperial coterie—a perfect storehouse, in fact, of details of the profligacy and lust of the Cæsar family, set forth with all the sincerity, impartiality, and relish of an arch-gossip. Yet withal there is no reason to doubt his veracity. As a writer his language is brief and precise, occasionally obscure, but without affectation. The fact of the younger Pliny's steadfast friendship for him is a strong point in his favour both as a man and as an author. His *Lives of the Cæsars* still maintains the reputation in which it has been held for centuries. Editions of S. are very numerous. The two earliest were published at Rome 1470, a third at Venice 1471. The editions of Burmann (Amst. 1736, quarto, 2 vols.), of J. A. Ernesti (Leips. 1748), and of Fr. Oudendorp (Leyden, 1751), are well known. The recension by C. L. Roth (Leips. Tauchnitz, 1858) deserves especial mention. See also Becker's *Quæstiones Criticæ de S. Cæss.* (Königsberg, 1862), and Unger's *Suetoniana* (Friedland, 1864).

Sue'vi, an appellation of various Germanic tribes in classic authors, seems to have been used somewhat loosely, as we find it employed to designate peoples widely removed from each other. On six different occasions tribes, probably Germanic, though possibly mixed with Celtic and Slavonic elements, appear in history under this name. (1) Cæsar (*B. G.*, I. 37, 51, 54, &c.) mentions S. living on the E. bank of the Rhine, and possessing 100 villages. (2) Tacitus (*Germania*) places them N. and S. of this, on both sides of the Upper and Middle Elbe. (3) In the second and third centuries they appear along with the Quadi and Marcomanni in Moravia and Bohemia. (4) In 406 S. cross the Rhine along with the Vandals and Alans, and break into Spain, settling more especially in Leon and Castile, whence they were driven by the Visigoths in 584. (5) In 420 another tribe called S. are spoken of in Upper Germany, who left their name to the modern Swabia. (6) In the 6th c. we hear of Nordsuevi, with a village Swevon on the Upper Elbe.

Su'ez, a gulf, isthmus, and town of N.E. Africa. The *gulf* is the western and longer of the two arms in which the Red Sea terminates. Its present length, which is believed to be less than in former ages, is 200 miles, and its average breadth 20 miles. The *isthmus*, uniting Africa and Asia, is 72 miles wide at its narrowest point. It is a sandy and stony waste, with no water save that of salt swamps or lagoons, and the geological indications point to its having been at one time a sea-bed. The isthmus is now intersected by the Suez Canal (q. v.). The *town* of S. is situated at the head of the gulf of the same name, 75 miles E. of Cairo, with which it is connected by railway. The harbour is a safe and roomy roadstead. The surrounding country was formerly a waste of burning sand, but since the construction of the freshwater canal from the Nile cultivation has been successfully commenced along its banks. Owing chiefly to French enterprise, the town is now well laid out and fairly built, with a moderate water supply. Its trade, which revived on the establishment of the Overland Route (q. v.) after languishing for three centuries, is again declining, owing to the competition of Port Said (q. v.). In 1877 the imports of S. amounted in value to £213,896, and the exports, of which ostrich feathers, ivory, gum, breadstuffs, and opium were the chief items, to £123,490. Pop. (1877) estimated at 12,000, of whom 2500 were foreigners.

Su'ez Canal, the artificial strait connecting the Mediterranean and Red Seas. From remote ages the Isthmus of Suez had been traversed by a canal, following nearly the line of the present freshwater canal described below, and joining the eastern or Pelusiac branch of the Nile at Bubastis, the modern Zagazig. The origination of the work is assigned by Aristotle, Strabo, and Pliny to Sesostris, but by Herodotus, with greater probability, to Pharaoh Necho, who reigned about 600 B.C., and the completion of it is variously accredited to Darius, King of Persia, and the Ptolemies. At all times the greatest difficulty seems to have been experienced in keeping the canal from being choked up with sand, a fate which befell it after its reopening by Trajan early in the 2d c. of the Christian era, and again in 767 A.D., after it had been cleared by Amru, the Arab general of the Calif Omar, and had remained open for more than 100 years. Thenceforward the matter was left in oblivion, until Napoleon I. caused a survey of the isthmus to be taken with a view to the reconstruction of the canal. Subsequent surveys were undertaken at the instance of several European governments, notably in 1849 and 1853, and they established the fact that there were no difficulties to be encountered from any difference in the level of the two seas to be connected. Nevertheless, in consequence of the unfavourable report of Robert Stephenson, the celebrated engineer, the canal project was abandoned, and the railway to Suez constructed instead. On 30th November 1854, however, M. Ferdinand de Lesseps, a member of the French diplomatic service in Egypt, who had been investigating the

matter since 1849, obtained from the Viceroy of Egypt a concession giving him the right to construct a canal from Suez to Tineh, on the Mediterranean, near the site of the ancient Pelusium. A year later an engineering commission reported favourably of this scheme, and it is in substance that which has been carried out, except that the Mediterranean entrance was finally fixed some distance to the W. of Tineh, on the narrow ridge separating Lake Menzaleh (q. v.) from the sea, and here was built the town of Port Said (q. v.). In 1858 a company was formed to construct the canal, two-fifths of the capital being found by the Viceroy, and the remainder being subscribed in Europe, and chiefly in France. The work was commenced on an unnoted day in 1860, and on 28th September 1869 M. Lesseps steamed from sea to sea in a small vessel. The formal opening of the canal took place on 17th November 1869, with great state, in the presence of the Khedive, Empress of the French, Emperor of Austria, Crown Prince of Prussia, and other distinguished persons.

The canal runs N. and S., and has a total length from sea to sea of 99 miles, with a width at the surface of 327 feet for 77 miles, and of 196 feet for the remaining 22 miles. The depth, for a width of 72 feet on the bottom, is 26 feet. At Port Said the entrance is protected by two massive breakwaters, respectively 2730 yards and 2070 yards long. Thence the canal skirts the eastern shore of Lake Menzaleh to Kantara (21½ miles), after which it crosses Lake Ballah, a marsh which is frequently dry, to El Ferdane (12 miles). A cutting 9 miles long then brings it to Lake Timsah, a depression 5 miles long, which was filled with water admitted from the Mediterranean. Here is situated the town of Ismailia (q. v.). From the southern end of Lake Timsah to Serapeum (7 miles) some deep excavations had to be made. Then followed two dry depressions, now known as the Bitter Lakes, and respectively 16 and 9 miles long, and 30 and 20 feet below the level of the Red Sea. They were filled with water admitted from both ends of the canal, and as they are of considerable width, the ship channel through them is marked by a double row of beacons. From the Bitter Lakes to Suez (19½ miles) much rock was met with, necessitating a great deal of blasting. Comparatively little difficulty was experienced, after all, from the sand, and the mud in Lake Menzaleh proved a much more serious obstacle. It was literally scooped out with the hands by the 15,000 local fishermen and others who were employed on this part of the work. Concurrently with the maritime canal, a freshwater canal was constructed from the Nile to Ismailia, and thence alongside the maritime canal to Suez. This freshwater canal, which communicates with Lake Timsah by a branch and lock, is navigable by small vessels, while the beneficial influence it has exerted on the climate and fertility of the country which it traverses is very great. The capital originally subscribed was £8,000,000, but the cost to the Canal Company of the entire undertaking, including the harbours, is stated to have been about £19,000,000, in addition to the value of lands and forced labour given by the Khedive, the value of which cannot be accurately estimated, but probably amounted to several millions more.

The S. C. reduces the length of the voyage from London to India from 11,379 to 7628 miles, a saving of 36 days' voyage. Since its completion the carrying trade between Europe and India has been revolutionised, and a class of steamers specially constructed for the new route has sprung into existence. The canal also exerts a marked and annually increasing influence upon the trade of Europe with Eastern Africa, the Malay Archipelago, China, Japan, and Australasia. In 1877 there passed through the canal 1651 vessels, with an aggregate tonnage of 2,251,556. Of these, 1291 vessels of 1,761,687 tons were British, and of the other countries whose vessels used the canal, the chief, in order of precedence, were France, Holland, Italy, Austria, Germany, and Spain. The revenue arising from the canal is yearly increasing, and in 1877 the total receipts of the Canal Company amounted to £1,339,617. In November 1875 the British Government purchased from the Khedive for £3,976,582 the original or founders' shares then held by him, numbering 176,602 out of a total of 400,000, but any interest that might accrue on these shares was already pledged by him up to 1st July 1894. See *Report on the Maritime Canal connecting the Mediterranean at Port Said with the Red Sea at Suez* (Lond. 1870); *The History of the S. C.*, by F. de Lesseps, translated by Sir H. D. Wolff (Lond. 1876), and Blue-Books.

Suffoca'tion. See Asphyxia and Respiration.

Suff'olk, the most easterly of the English counties, is separated N. from Norfolk by the Waveney and Little Ouse, W. by the Lark from Cambridgeshire, and S. by the Stour from Essex, while on the E. it is washed by the North Sea. Area, 949,825 acres; pop. (1871) 348,869. The coast-line, broken by the estuaries of the Stour, Orwell, Deben, and Alde, is generally low, and the sea has made great encroachments, Dunwich having lost six of its seven churches. The geology of S. is simple. The chalk formations of the W. dip under the London Clay of the Eocene and the Red Crag of the later Pliocene, which occupy the south-eastern and eastern portions. The Red Crag is especially characteristic of this part of England, and probably extends under the diluvial deposits which cover the central districts. The surface is level, the climate cold and dry, the soil for the most part a heavy loam, but in the W. a sandy tract is interspersed with fenny offshoots of the Bedford Level (q. v.). A highly-developed system of agriculture is steadily advancing, in spite of the great 'lock-out' of 1874, when 840 labourers left the county. In 1876 there were 383,850 acres under corn crops, 122,968 under green crops, 89,498 under clover, sainfoin, and grasses in rotation 146,524 in permanent pasture, and 32,562 in wood. The area of the wheat crop in 1878 was 147,210 acres. The number of horses in 1876 was 42,869, of cattle 60,281, of sheep 434,333, and of pigs 120,484. The chief manufactures are those of agricultural implements and artificial manure, the yield of coprolites and phosphatic nodules employed in the latter industry amounting (1877) to 69,000 tons in S. and Bedfordshire together. Herring and other fisheries also employ (1878) 809 boats and 3344 persons, belonging to Lowestoft, Woodridge, and Ipswich (the county town). S. returns four members to Parliament. Its antiquities include a Roman castle at Burgh, the abbeys of Bury St. Edmunds, Leiston, Butley, and Bungay, and the medieval castles of Framlingham, Wingfield, Oxford, and Mettingham. The churches are distinguished by their elaborate flint-work tracery, and S. contains many fine examples of Elizabethan domestic architecture. See Suckling's unfinished *History of S.* (1847).

Suff'ragan was originally a designation of every provincial bishop as having a vote (Lat. *suffragium*) in the councils of the Metropolitan (q.v.). In the Church of England, under Henry VIII., it was applied to certain bishops with a limited jurisdiction under the diocesan, similar to the old chorepiscopi, and the office has been revived in recent times.

Suff'rage (Lat. *suffragium*, 'a vote'), the right to vote for any purpose, but especially the right of a citizen to vote in the election of his representatives in the legislative and administrative bodies of his country. One of the most important questions in the theory of representative government is naturally that of the best method of constituting and distributing the S. Most modern writers on political science maintain that the S. should be made as wide as is safely possible, because it is an important educational and moral agent, enabling a man to realise his stake in the country, and encouraging him to take an intelligent interest in national affairs. On the other hand, the theory of the English constitution, and of other constitutions where the S. is limited by a property qualification, is, that in the present state of education it is dangerous to admit the mere proletariat to a voice in the conduct of national affairs. In all countries infants, minors, idiots, and criminals are excluded from the S., as are also women, except in some special elections—*e.g.*, the school-board elections in the United Kingdom. It is maintained by the supporters of female S. in England, that the Reform Bill of 1867 leaves a loophole for female voting by not sufficiently defining whether the word 'man' means male persons, or is merely a generic term equivalent to *name*, and this question is now (1878) about to be put to the test.

Su'fism is the faith of a sect or class of Mohammedan devotees chiefly found in Persia, whose name probably means 'sages,' derived from Greek *sophos*, 'wise' (*cf.* Gnostics, from *gnōsis*, 'knowledge'), and who form a kind of ecclesiastical order similar to the Dervishes (q. v.). S. had its origin (9th c.) in that pantheistic mysticism which for centuries pervaded the East, and which exhibited itself chiefly in a search for metaphysical purity, for the illumination of the mind, for calmness of soul, and for the subjugation of the passions, by the exercise of painful austeri-

ties, and the adoption of an ascetic life. The object of the Sufi is to attain to the light of heaven, towards which he must press forward till perfect knowledge is reached in union with God, or after death in absorption into the Divine Being. In this spiritual journey there are various stages. Starting from his natural state, the devotee passes through science, love, seclusion, knowledge, ecstasy, touch, and union with God, to final extinction. The theological language of S. is to a great extent allegorical and symbolical. Their chief doctrines are taught under the figures of love, intoxication, &c.; and such terms as truth, love of God, &c., have a mystical meaning quite different from their ordinary Christian application. See Malcolm's *History of Persia* (Book I.), and Tholuck's *Sufismus* (Berl. 1821).

Su'gar, in chemistry, the name of a series of carbo-hydrate compounds, characterised by their ready solubility in water and prevailing sweet taste. In composition and properties they are closely allied to Starch (q. v.), which though insoluble may be converted into one variety of S. S. exists abundantly in the juices of plants and ripe fruits, and also in the animal body. *Cane S.*, *Saccharose* or *Sucrose* ($C_{12}H_{22}O_{11}$), the sweetest and best-known variety, is distinguished by its oblique 4-sided prismatic crystals terminated by 2-sided summits. When heated it melts into a glassy mass (barley S.), and at about 400° F. it decomposes, forming an amorphous brown body called enamel. On being absorbed in the animal system, or on undergoing fermentation, it is transformed into *grape S.* or *Glucose* ($C_6H_{12}O_6$), which may also be prepared from starch and vegetable fibre (cellulose) by the action of acids, and exists largely in many dried fruits, besides constituting almost the entire bulk of honey. It has three principal modifications, dextrose, lævulose, and maltose, the latter being the sweet principle of malt. *Lactose* or *milk S.* ($C_{12}H_{22}O_{12}$) dissolves with difficulty, and has little sweetness, and on absorption is transformed into grape S. Inosite or muscle S., Manuite (q. v.), and glycarrhezisi from Liquorice (q. v.), are allied substances.

Manufacture of S.—Three forms of sugar enter into commerce—ordinary or cane sugar, starch sugar (glucose), and sugar of milk (lactose), the two latter being of insignificant consequence compared with the first. Cane sugar is a constituent of very many succulent vegetables and fruits, but its commercial sources of importance are the sugar-cane and beet-root. In China and in the United States of America it is prepared to some extent from the sugar millet (*Sorghum saccharatum*); in India, Ceylon, and Egypt it is produced from the date-palm and several other species of palm; and in the United States and Canada some amount is annually obtained from the trunk of the sugar-maple (*Acer saccharinum*).

The cultivation of the sugar-cane and the art of extracting sugar therefrom have been in practice from remote times in India and China, where primitive processes are in operation to the present day. Sugar was not used by the Greeks and Romans, although some of their writers allude to the cane; and practically the knowledge and use of the substance only became diffused among Western nations after the Crusades. From the Asiatic continent canes were first carried to Cyprus, whence they were introduced into Sicily, in which island, it is known, a large quantity of sugar was manufactured as early as 1148. In 1420 the plants were introduced by the Portuguese into Madeira, and they were carried to America with the earliest settlers.

The sugar-cane (*Saccharum officinarum*) is a jointed grass growing about the thickness of the arm, and to the height of 6 to 12 feet. It is a native of India and China, but its numerous varieties are now disseminated throughout all tropical and subtropical regions. The varieties most extensively cultivated are the Otaheite, Batavia, Creole, and the Violet Java canes. The plants are principally propagated from cuttings, which ripen in from twelve to fifteen months, and in a mature condition they contain about 90 per cent. of juice, having from 12 to 20 per cent. of sugar, the average amount being 18 per cent. In practice, however, not more than ½ of the sugar in the canes is obtained as raw sugar, ¼ being left in the refuse cane, and ¼ going in the form of uncrystallisable molasses, and as skimmings in the preparatory operations.

The operations of preparing raw sugar from canes embrace, 1st, expression of the juice; 2d, defacation and clarification of the juice; 3d, concentration; 4th, granulation and separation of the crystals from the uncrystallisable molasses. Expression of the juice is effected by passing the newly-cut canes between the heavy cast-iron rollers of a sugar-press or mill. The rollers are in a series of three—two lower on one level, and an upper revolving between them. The canes are bruised between the upper and first rollers, and thoroughly exhausted by the squeezing they receive between the upper and second of the two lower rollers. Without loss of time the expressed juice is submitted to the operations of clarification and boiling, as no sooner is it liberated than a process of acetous fermentation is induced. The clarification is effected by adding lime to the juice, which combines with and neutralises the acids, besides otherwise acting on its constituents. The heating of the juice to which it is at the same time submitted causes its albuminoid constituents to coagulate and rise to the surface in the form of a thick green scum. From the first clarifying-pan the juice is passed into a series of four or five more, arranged in a series and heated by one fire, or, as is now generally the case, by steam-heat. The skimming is continued so long as any scum rises; the juice gradually becomes clear and concentrated, till in the last pan the bubbles which rise burst with a cracking noise. The thick syrup now passes into large, shallow pans, in which as it cools sugar crystals form, and after twenty-four hours' time, means for separating the uncrystallised portion are adopted, these being either (1) by use of centrifugal force, (2) by pouring the mass into moulds having an opening through which the syrup gradually drains off, or (3) by the process of claying, in which moist clay is applied to the thick end of the filled mould, the moisture from the clay passing through the sugar and carrying away with it the uncrystallised portions. Improved and modified processes of manufacture are numerous, and in operation in many sugar-producing countries. Bisulphite of lime is very largely used as a defacating agent, and after the clarification of the juice it is frequently the practice to pass it through a bag filter or a charcoal filter, and to evaporate it to the crystallising point in a vacuum pan, as done in the refining process in British refineries. The finished sugar is also commonly freed from molasses by use of the centrifugal machine, and sugar thus treated is ready to pass into use without undergoing the further refining process to which ordinary raw sugars are subjected. The principal varieties of raw sugar from cane are known in commerce by the name of the localities whence they come, with the distinction 'muscovad,' 'centrifugal,' 'clayed,' and 'concrete,' according to the method of finishing. Raw sugar from cane has a pleasing aromatic odour and taste very different from the odours of unrefined beet-root sugar. The ultimate uncrystallisable residual molasses is used for making rum, or it is sold for use as treacle.

Beet-root Sugar.—In the year 1747 the German chemist Marggraf demonstrated the existence of cane sugar in beet-root, and suggested it as a source of the material, but it was not till 1800 that the manufacture was actually commenced in France under the stimulus of the blockade of French ports during war. For many years no great success attended the beet-sugar industry, not more than 13,000,000 lbs. having been prepared from that source in 1811, but now, as will be seen below, the industry has attained dimensions which almost rival the sugar-cane manufacture. The variety of the beet-root (*Beta maritima*) most valued for sugar-making is the white Silesian, and its cultivation for S. manufacture is now a most important industry in France, Germany, Austro-Hungary, and Russia. The proportion of sugar obtained in beet-root may vary from about 9 to 18 per cent., a fair average yield being, however, 10 or 11 per cent., and weather has a great influence on the yield of the roots. The processes employed in the earlier stages of the preparation of beet-sugar differ from those followed in the case of the sugar-cane. They embrace the following operations:—1, Washing and cleaning the roots; 2, Pulping or otherwise treating the cleaned roots, and extracting the juice by hydraulic pressure or by centrifugal force; 3, Clarification of the juice by heat and lime; 4, Removal of the lime by the action of carbonic acid; 5, Filtration of the juice through charcoal; and 6, Evaporation of the juice, and boiling of it to the crystallisation point in the vacuum pan. The subsequent processes are essentially the same as those employed for sugar from canes. The molasses of beet is used for preparing an inferior kind of spirit, or used only for the feeding of cattle.

Refining.—The greater part of the raw sugar produced, both cane and beet, cannot be brought into use without undergoing a

process of refining. For this purpose the raw sugar is dissolved in hot water and filtered through long cotton bags (bag-filters) to remove the mechanical impurities present in the sugar, such as sand, chips of wood, insects, &c. To remove the colouring matter the solution is then passed through a filter of animal charcoal, the stratum of charcoal being several feet in thickness, and the clear pure solution which is thereby obtained is run into a vacuum pan, in which it is evaporated down to granulation point. The object of using a vacuum in the boiling of sugar solutions is to enable the evaporation to be conducted at a low temperature, as where saccharine solutions are submitted to high temperature, a large proportion of uncrystallisable syrup is formed. In the vacuum pan the evaporation goes on rapidly; and as the boiling point is low, in proportion is the uncrystallisable residue small. The evaporated solution from the vacuum pan is introduced into a centrifugal machine, by which the fluid syrup is separated, and dry crystals ready for packing in casks are obtained. When loaf-sugar is to be made, the contents of the vacuum pan are run into a vessel called a 'heater,' in which by the action of steam any crystals which have formed are re-dissolved. The hot solution is then poured into moulds of the well-known form of sugar-loaves, in which the sugar sets and crystallises, care being taken to have the crystals formed of uniform size. From an aperture in the top of the mould the green syrup drains off, and when that draining has ceased the loaves are further purified by 'liquoring,' a process which consists in pouring concentrated solution of pure sugar over each loaf, such solution sinking through the loaves and carrying away any remaining impurity. The 'liquoring' is repeated two or three times, and, when thoroughly drained, the loaves are dried in an oven, and so prepared for the market.

The total production of sugar throughout the world during 1876 was estimated at 3,650,000 tons, of which 2,140,000 tons were from canes, 1,320,000 tons from beet-root, 150,000 tons from the date and other palms, and 40,000 tons from maple and sorghum. Of the total amount of cane sugar about ⅓ was yielded by the island of Cuba, and about ⅔ by the W. Indies (Cuba included) and S. America. Java yielded about 200,000 tons, Manila 130,000 tons, and Mauritius 100,000 tons. The production of sugar from beet-root has developed with remarkable rapidity in Europe, the culture being at present artificially stimulated by a practical system of granting bounties to refiners who export sugar from France and the other principal beet-cultivating countries. During the last ten years the quantity of beet-root sugar made has been doubled, and the following is the estimated yield of the crop for season 1878:—Germany, 370,000 tons; France, 370,000 tons; Russia, 220,000 tons; Austro-Hungary, 245,000 tons; Belgium and Holland, 90,000 tons; in all, 1,295,000 tons. The import of sugar into Great Britain during 1877 was of refined, 3,429.853 cwts., value £5,794,232 (from France, 2,069,543 cwts., value £3,464,915); of unrefined, 16,620,944 cwts., value £21,381,441 (British W. Indies, 2,352,071 cwts., value £3,128,909); of glucose, solid or liquid, 276,627 cwts., value £273,997; of molasses, 298,261 cwts., value £141,315. The English race are by far the greatest consumers of sugar, the quantity used in Great Britain being 62·8 lbs. per head; United States, 37·8 lbs.; Dominion of Canada, 51·4 lbs.; Australian Colonies, 85·9 lbs.; Holland, 25·03 lbs.; France, 15·5 lbs.; Russia, 5·4 lbs.; and Spain, 54 lbs. These enormous variations have a very obvious relation to the nature of the food used by the various races, and are affected only in a minor degree by wealth and luxurious habits.

Medicinal Properties of S.—S. is a demulcent, and is prescribed in catarrhal affections in the form of candy, syrup, &c., and is also employed in pharmacy to render oils miscible with water, and in the preparation of confections and lozenges. It also enters into the composition of several mixtures and pills. Syrups are prepared by dissolving six parts of refined S. in three parts of distilled water with the aid of heat, and when cool adding water to weigh nine. Seven measures of syrup contain six of S. *Saccharum lactis*, or *S. of milk*, is prescribed in cases of phthisis and other pulmonary affections, and in cases of extreme irritability of the stomach, and is also used as a substitute for the milk of the mother, or for mixing with the food of children.

Sugar-Cane (*Saccharum*), a gigantic perennial grass with a solid jointed stem often 10–15 feet in height, sheathed by ribbon-shaped leaves of 4–5 feet long, and surmounted by an elegant, large, and diffuse panicle of soft hairy florets. It is a native of India, China, and the South Sea Islands, in which countries the rough extraction from it of saccharine juice dates back to very remote times. About the middle of the 12th c. the S.-C. is supposed to have been introduced by the Saracens into several islands of the Mediterranean, where for a considerable period an abundance of sugar was made. Its extension westward was continued later on into Spain, the Canaries, and Madeira. Shortly after the discovery of the New World it was transplanted to some of the W. India Islands and the Brazils. The culture has since become general in warm climates. In the United States the profitable cultivation of the cane ceases at 32° N. lat., in China it extends only to 30°. Prolific yields have occurred in Australia as far S. as 28°. Moderate vicinity to the sea is favourable to growth. Rich manuring is necessary to obtain good crops, unless in the best virgin soil; and in order to promote growth upwards, as well as to provide ventilation and access of light to the plants, the superabundant suckers around the base and the lower leaves of the stem must be successively removed. Excessive rains produce a rank luxuriance of the canes at the expense of the saccharine principle. The multiplication is usually affected from top-cuttings, but this cannot be carried on from the same original stock for an indefinite period without deterioration, and as seeds hardly ever ripen, new plants must from time to time be brought from a distance. Thus New Caledonia has lately supplied wild-growing splendid varieties for the replanting of sugar-fields in the Mauritius. The length of time required to ripen the cane varies much according to the situation in which it is planted and the special variety, some sorts becoming ready for practical operations in about ten months, while others require from twelve to twenty months. A Chinese S.-C. named *S. Sinense*, which is hardier and bears drought better than the ordinary kind, and needs renewal only every second or third season, will, if planted early in spring, ripen in seven months. Numerous varieties of the S.-C. are now established, among these the Bourbon is praised as one of the richest in sugar, and the Batavian variety (*S. violaceum*) is content with less fertile soil. The average yield of sugar varies from 26 cwts. to 3 tons per acre. The tops and green leaves of the cane are good food for cattle. *Saccharum* is a large genus, but, excepting the sugar-yielding species, none are of much importance.

Sugar-Mite, a name given to the *Tyroglyphus sacchari*, a species of *Acarina* or Mite (q. v.) found in unrefined sugar. The body is oval-shaped, the mandibles scissor-like, and the feet have suckers. Dr. Hassall of London reported that in 69 out of 72 samples of unrefined sugar mites were discovered. Grocer's itch is caused by these creatures. Over 500 have been found in ten grains of sugar; one pound may thus contain 100,000 sugar-mites.

Sugar-of-Lead. See LEAD.

Suhl, an old town of Prussia, province of Sachsen, at the base of the Domberg, 35 miles S.W. of Erfurt by rail. It lies to the S.W. of the Thuringer-wald, and is sheltered by the Ottilienstein, a cliff of porphyry. Its firearms have been famous for several centuries, and its steel and iron wares are of superior quality. As its name indicates (Sorb-Wendish, 'salt'), it was formerly a salt-mining centre. There are iron mines in the vicinity. A mineral spring rich in chloride of calcium was discovered here in 1878, and the authorities hope to transform S. into a fashionable watering-place. Pop. (1875) 10,721. See Werther's *Sieben Bücher der Chronik der Stadt S.* (2 vols. 1846–47).

Suhm, Peter Frederik, a Danish historian, son of Admiral Ulrik Frederik S., was born 18th October 1728, studied law at Copenhagen (from 1746), and in 1748 became assessor in the Supreme Court. In 1751 he married a rich merchant's daughter of Throndhjem, where he remained for fourteen years in close friendship with the Norwegian historian Schöning, on whose removal to Sorö (1765) he returned to Copenhagen. S.'s great work is his *Historie af Danmark*, 14 vols., of which he only published 7, the rest being published from his MS. by Kall and Nyerup (1806–28). It comes down to 1400, and is the most copious collection of materials for Danish history. S. also continued Langebek's *Scriptores rerum Danicarum.* His *Samlade Skrifter* are published in 16 vols. (1788–89). His library of

100,000 vols. he made over in 1796 to the great Royal Library at Copenhagen for a small liferent. He died September 7, 1798.

Su'icide (Lat. *se*, 'oneself,' and *cædo*, 'I slay') is the act of designedly destroying one's own life. To constitute S., in a legal sense, the person must be of the years of discretion and of a sound mind. The law of England treats S. as a felony involving the forfeiture to the crown of all the personal property which the party had at the time he committed the act, including debts due to him; but it is not attended with forfeiture of freehold, or corruption of blood. The body of the self-murderer was required to be buried without Christian rites in the open highway or cross-roads, and a stake was thrust through it to mark the public detestation. This law was repealed during the reign of George IV., and the only consequences now are forfeiture of goods and deprivation of Christian rites. The burial may take place in a churchyard, but between 9 and 12 P.M. S. was treated as venial by the Romans, and was esteemed a virtue, in certain cases, by the Stoic and Epicurean philosophers. Valerius Maximus, who wrote in the 1st c., states that a poisonous liquor was kept publicly at Massilla, and that it was given to such as presented themselves before the senate and procured its approval of the reasons which prompted them to get rid of life. S. is often set down as furnishing positive evidence of insanity, and it has been affirmed that the suicidal propensity is, in all cases and under all circumstances, a positive sign or symptom of insanity. This, however, is not in accordance with the opinions of many psychologists, nor is it consistent with well-known facts. The law of England very properly treats S. as a felony; and those who commit S. are held to be sane and responsible, unless there be clear evidence to the contrary.

S., however, is a very frequent result of insanity, more especially in Christian countries, and the verdict generally given by coroners' juries is that the person destroyed himself while in a state of unsound mind; not so much, however, from the fact of insanity being thereby established, as that any other verdict would distress the surviving relations and friends of the deceased. Suicidal mania or insanity may be defined as a perversion or reversal of the natural instinct of love of life, leading to its destruction. Drs. Bucknill and Tuke give the following classification of this form of insanity:—'First, there are cases in which the instinct of self-preservation is more especially diseased, being as it were reversed in its operation. There is here a blind, unreasoning, irresistible impulse to commit S., a true suicidal monomania. This form may present the spectacle of an individual perfectly reasonable, influenced by an enlightened religion, physically and morally happy, well aware of the criminality of S., yet impelled to commit it in spite of himself by a force acting automatically and superior to his reason and will. Secondly, S. may be the result, not of an instinctive monomania, but of melancholia. The degree in which the patient is depressed is not the measure of his tendency to S.; at the same time intense depression is, in a large number of instances, the immediate antecedent of the suicidal act. The third division comprises those cases of S. which spring from delusions, hallucinations,' &c. Other and more vulgar causes of S. are the love of notoriety, the force of imitation, and the remorse or fear that follows homicide. See *Anatomy of S.*, by Dr. Forbes Winslow; *Du S. et de la Folie S.*, par Brièrre de Boismont; *Traité du S.*, par M. Bertrand (Par. 1857); *Du S.*, par M. Debreyne; and *Psychological Medicine*, by Drs. Bucknill and Tuke (Lond. 1874). For medico-legal aspects of S. see *Medical Jurisprudence*, by Dr. Alfred Taylor (1873).

Su'idæ, a family of *artiodactyle ungulata*, in which two functional toes are developed, with two rudimentary toes in addition. The canine teeth are large, and in the males form tusks. The tail is short, and the skin sparsely covered with hair. Of the S., the *Sus scrofa* or wild boar, the *Sus Indicus* or Indian hog, and the *Sus Babirusa* or Babyroussa hog, the Peccaries, and Wart hogs are the best-known genus.

Su'idas, the reputed author of a Greek Lexicon, is supposed to have flourished in the 10th c. A.D., but nothing is known concerning him. The work bearing his name is a kind of encyclopædia, with frequent interpolations by later hands, and is only valuable as preserving fragments of authors whose works have otherwise perished. It has been edited by Gaisford (3 vols. Oxf. Clar. Press, 1834) and Bernhardy (2 vols. Halle 1834–53).

Sui Juris, in Roman law, denoted the condition of any one not subject to the *Patria Potestas* (q. v.), and therefore practically his own master.

Suir, a river of Ireland, rises in Tipperary, separates that county from Waterford, and joins the Barrow at Passage, after a course, first S. and then E., of 100 miles. It passes Thurles, Cahir, Clonmel, and Carrick, and is navigable by barges.

Suit in law. See ACTION.

Su'khum Ka'le, a seaport and military station in Asiatic Russia in the government of Transcaucasia, is situated at the foot of the Caucasus on the E. shore of the Black Sea. In 1831 a commercial port was established here, which has, however, been much overshadowed by Poti (q. v.), 48 miles S., but it is still a station on the line of the Black Sea Telegraph, and a shipping place of the Russian steamers. On May 14, 1877, S. K. was captured after bombardment by the Turkish ironclads, and played a somewhat important part during the subsequent conduct of the war as a Turkish base of operations. Pop. (1874) 1161.

Suleimán Mountains, a lofty range forming the W. boundary of the Punjaub and Scinde, and the frontier (1878) of the British Empire in India on the side of Afghanistan and Beluchistan. They run from N. to S. for about 350 miles, stretching from the Khyber Pass almost to the seaboard. The highest peak is the 'Taikh-i-Suleiman,' or 'Soloman's Throne,' 11,000 feet above the sea. The fall is abrupt towards the Indus, but gradual towards the table-land of Sewestan. They give birth to no rivers, and are regarded by the Afghans as their own original home. The principal passes from N. to S. are the Kuram, the Gomal, and the Bolan.

Suli'na, the most important commercially of the delta branches by which the Danube (q. v.) enters the Black Sea. The main branches are the Kilia in the N. and the Tultcha in the S., and the latter separates again into the S. and the St. George. The Kilia and St. George debouch about 50 miles apart, and about midway issues the S., which has a small volume but a deep channel. The construction of concrete 'parallel piers,' 5850 and 4310 feet long respectively (1856–61), transformed the mouth of the S. into the best commercial harbour in the Black Sea. The depth thus secured on the bar was 17 feet, and this was increased to 20 by the extension of the southern pier and the consolidation of the whole in 1872.

Suliots, the Greco-Albanian race who in the 17th c. founded eighteen villages in the mountainous district of Suli in S. Albania, and there established a small democracy. This they defended manfully against the Turks till 1803, when Ali Pasha (q. v.) mastered and almost annihilated them, the remnant taking refuge in the Ionian Islands. Recalled by Ali in 1820 to aid him against the Sultan, they shared his fall, but under Bozzaris (q. v.) again came forward in the Greek war of independence. Their district made definitely over to Turkey by the treaty of 1829, most of the S. migrated to Acarnania and Ætolia in Greece, where their present number is estimated at 12,000. See Perrhæbos' *History of Suli* (Eng. trans. 1823), Ludemann's *Suliotenkrieg* (Leip. 1825), and Finlay's *History of the Greek Revolution* (Edinb. 1861).

Sull'a, Lu'cius Corne'lius, was the son of L. Cornelius S., and was born in 138 B.C. Brought up amid the luxury then prevalent at Rome, he spent much of his time in the pursuit of sensual pleasures. In 107 he was elected quæstor, and served as a cavalry officer in the Jugurthan war under Marius, when he displayed brilliant military talent, taking Jugurtha prisoner in 106. Returning to Italy, he served from 104–101 in the Cimbric war, at first under Marius, but latterly under Catulus. In 92 he went as proprætor to Cilicia. While there he expelled from Cappadocia the usurper whom Mithridates had installed there, marched to the Euphrates, and in an impressive interview with the Parthian king Arsaces, established relations between Rome and Parthia for the first time. In 91 S. returned to Rome, and found himself regarded as a leader of the oligarchy and an opponent of Marius. Bitter feuds which broke out were quenched by the excitement of the Social war, in which S. took a distinguished part, leading the southern army against Samnium in 89. The practical extinction of the insurrection in 88 gave time for the prosecution of the Mithridatic war. The coveted post of leader in this enterprise now became matter of contest between the populace led by a

tribune Sulpicius and the senatorical oligarchy. The latter, whom S. supported, having made him consul, confirmed him in the command of the army he had previously led, which was the one now destined to the Asiatic wars. Sulpicius, however, by a tumult carried the appointment of Marius, whose messengers brought the news to the camp. The troops tore them to pieces, and enthusiastically followed S. to the capital. He entered it amid general alarm, suppressed the Marian opposition, and encamped in the market-place. S. was now master of Rome, but after repealing the Sulpician rogations, and perhaps making other changes in favour of the senate, he hurried to Greece, which was overrun by Mithridates. Soon he defeated Mithridates' general Archelaus, and laid siege to Athens, which fell in 86. The victory of Chaeronea, following shortly after, was rendered fruitless by the sudden appearance of the Roman general Flaccus, sent to supersede S. Flaccus, however, declined battle and crossed to Asia. Next year (85) S. defeated the second Pontic army sent to Greece at Orchomenus, and in 84 Mithridates signed peace at Dardanus, and S. sailed for Europe with a portion of his troops. The Marian party, now led by Carbo, made active preparations to resist him, but when he landed at Brundisium in the spring of 83, multitudes flocked to his side. Young Pompey raised his standard in the N., and S. himself defeated the Marian consul Norbanus at Mount Tifata in Campania. Next year (82) he routed the son of Marius in a great battle at Sacriportus and entered Rome. The Marians struggled on for some time in various parts of the Roman possessions, but a battle at the Colline gate took the life out of all resistance in Italy. On his own recommendation S. was made dictator by the Senate, and continued in that position till 79, though during most of this time he kept up the forms of the constitution, and was annually elected to the consulship as well. Having got rid of all the leaders of the Opposition by the famous 'proscriptions,' S. proceeded to his remarkable re-establishment of the oligarchy. He filled up the thinned ranks of the Senate, making the principal ex-magistrates members *ex officio*; transferred to it the entire legal jurisdiction, which had formerly rested with the capitalists or *equites*; and generally increased the number of magistrates, and discriminated more clearly between civil and military functions. The censors' authority, many of the tribunes' chief powers, farming of revenues, largesses of corn, were abolished. Military colonies were established, and municipal constitutions granted to provincial towns. In 79 S. suddenly resigned his position, retired to Puteoli, spent his remaining days in artistic, literary, and lower pleasures, and died next year (78). For a vivid sketch of his habits and a striking analysis of his character and policy see Mommsen's *Römische Geschichte* (Eng. trans. by Dickson, vol. 3).

Sull'ivan, Arthur Seymour, an English composer, was born in London in 1844, sang when a child in the chapel-royal, and was educated at the Royal Academy of Music. At the age of fourteen he gained the Mendelssohn scholarship, enabling him to pursue his studies under the best masters at home and abroad. He composed the incidental music for the *Tempest*, performed at the Crystal Palace in 1862, and since that time his works have been many and varied. Among the most important are the cantatas of *Kenilworth* and *The Bride of Neath Valley*, a Symphony in E Minor, and two oratorios, *The Prodigal Son*, produced at the Worcester Festival in 1868, and the *Light of the World* (Birmingham Festival, 1873). He has also composed several bright and tuneful operettas, such as *Cox and Box*, *The Contrabandista*, *Trial by Jury* (perhaps his best work for the stage), and the successful two-act comic operas, *The Sorcerer* and *H.M.S. Pinafore* (1878). In the last three works Mr. W. S. Gilbert was his literary coadjutor. Mr. Sullivan is one of the most popular song composers of the day. He conducted the English concerts at the Paris Exhibition, and the Promenade concerts at Covent Garden, in 1878.

Sull'ivan's Island, an island at the N. side of the entrance to Charleston Harbour, South Carolina, 6 miles from Charleston. It is 6 miles long, but very narrow, and is a favourite sea-bathing resort. Upon it is situated Fort Moultrie, a position of importance during the civil war.

Sully, Maximilien de Béthune, Marquis de Rosny, and Duc de, was born at Rosny, of an old but impoverished Huguenot family, 13th December 1560, and at the age of twelve attended Henri de Navarre to Paris. He entered the Collège de Bourgogne, whose principal saved him from the St. Bartholomew, and in 1576 he fled with Henri to the Politique-Huguenot camp. The hope of obtaining from Anjou a confirmation in his ancestors' Netherlandish possessions made him follow that prince to the Low Countries (1581); but by 1585, having married meanwhile a wealthy heiress, he was back with his former master, doing good service against the League. In 1593 he counselled Henri, now Henri IV. (q. v.) as to his conversion; and four years later, favoured by Gabrielle d'Estrées, became his minister of finance. He found a chaos, and established order, not by far-seeing, philosophic methods, but by expedients like taxes on the necessaries of life and on official incomes, still more by his general thrift and terrible punishment of peculation. He further reformed the Arsenal, established a small but well-disciplined standing army, improved the public works, and withal was hated and feared by all men but the king, who trusted him with the conduct of the war in Savoy (1600), made him governor of the Bastille (1602), and raised him (1606) to be Duc de S. In Henri's assassination S. read his inevitable fall; and though the Queen-Mother and her court showed him all due respect, though Louis XIII. created him marshal (1634), he abstained from politics, his one attempt at mediation on behalf of the Huguenots (1621) proving unavailing. He died at the château of Villebon, near Chartres, 22d December 1641, having latterly busied himself with superintending the *Mémoires des sages et royalles Œconomies d'estat Domestiques Politiques et Militaires de Henri le Grand*, which, really printed at Sully in 1634, bears a feigned imprint, Amsterdam. This work, revealing the harsh uprightness and egotistical loyalty of its compiler, is of infinite value to the historian, and in its posthumous continuation (vols. iii.-iv. Par. 1662) occurs the 'splendidly-audacious scheme of a European Amphictyonic Assembly, a Christian Republic composed of fifteen states, from whose number Russia and Turkey should be excluded,' in which were foreshadowed the dreams of Napoleon III. See vols. i.-v. of Ranke's *Französische Geschichte* (2d ed. 1857-62), and vol. iii. of Kitchin's *History of France* (Oxf. Clar. Press 1877).

Sulmo'na, an old town of S. Italy, province of Aquila, in the Abruzzi, picturesquely situated on the Pescara, between two mountains, 35 miles S.W. of Chieti by rail. It has several old palaces with Gothic windows, and a town-hall of the 16th c., the façade of which is adorned with statues of popes. It manufactures paper, leather, dyes, &c. Pop. (1874) 12,594. The *Sulmo* of the Peligni, it was the birthplace of Ovid and his 'cool home abounding in water.'

Sulphocyan'ic Acid ($CNHS$), analogous in composition to Cyanic Acid ($CNHO$), is prepared by heating the sulphocyanide of mercury in a current of dry sulphuretted hydrogen, or hydrochloric acid gas, when the acid distils as a crystallisable colourless liquid. The mercury salt is obtained by precipitating a mercurous salt with sulphocyanide of potassium, which is formed when cyanide of potassium and sulphur are fused together. The potassium salt is a delicate laboratory test for ferric compounds, giving a deep-red colour to the solution.

Sulphovin'ic Acid, or Ethylsulphuric Acid ($C_2H_6SO_4$), is formed by the action of sulphuric acid upon alcohol, an action accompanied by a great evolution of heat. It forms sulphovinates, which are easily decomposed by heat. In the preparation of ether from alcohol and sulphuric acid, S. A. is an intermediate product if the temperature be under 100° C.

Sul'phur ($S = 32$) occurs abundantly in nature in the uncombined state, chiefly in volcanic regions. In combination with hydrogen it exists in many mineral waters, and is besides a constituent of numerous ores. Of the sulphides we have iron pyrites (FeS_2), copper pyrites (Cu_2S,Fe_2S_3), galena (PbS), blende (ZnS), cinnabar (HgS), and crude antimony (Sb_2S_3); and of sulphates the most conspicuous are gypsum ($CaSO_4 2H_2O$), heavy spar ($BaSO_4$), celestine ($SrSO_4$), Epsom salts ($MgSO_4,7H_2O$), and glauber's salt ($Na_2SO_4 10H_2O$). Sulphates are also found as a constituent in vegetable and animal albumen and similar products. Our supplies of S. come mainly from Sicily, where it is found uncombined in beds of blue clay, frequently associated with some native sulphate. The S. is separated from these impurities by distillation, and in the form of *rough* S., still contain-

ing some 3 or 4 per cent. of earthy impurities, it is imported. To separate this residue it is re-distilled, and the vapour is at once condensed as *flowers of S.* or *sublimed S.* upon the walls of a brick chamber. After some time the walls become sufficiently heated to melt the substance, which is allowed to collect and is then cast into wooden moulds, where it cools and forms *roll-S.* or *brimstone*. It is also obtained by ordinary distillation without sublimation, and in this form is preferred for the manufacture of gunpowder. Another important industrial source of S. is from iron pyrites, which when strongly heated parts with about one-fourth of its S. The distillation is effected in conical fire-clay vessels, through a perforated plate, at the smaller end of which the S. vapour passes. Each vessel contains 100 lbs. of pyrites, which yield 14 lbs. of S. Roasting copper pyrites is another effective method for preparing S., which when prepared thus generally contains a little arsenic. S. is also a waste product in the manufacture of Soda (q. v.). In this country vast quantities of S. are annually consumed in the manufacture of sulphuric acid, gunpowder, lucifer matches, vulcanite, and sulphurous acid (used for bleaching purposes). The total imports of S. into the United Kingdom for 1877 amounted to 1,085,614 cwts. (value, £317,596), of which 1,064,591 came from Italy alone, and 17,270 from Belgium. The vast S. beds of Iceland have not yet been utilised, but will probably become of great commercial importance in the future.

S. is a yellow, brittle solid, insoluble in water, but soluble in bisulphide of carbon, oil of turpentine, benzol, and to a slight extent hot alcohol. It inflames at a temperature of 260° C., burning with a pale-blue flame, and emitting the well-known pungent suffocating vapour, sulphurous acid (SO_2). It melts at 120° C., forming a pale-yellow limpid liquid, which darkens and grows viscous as its temperature is raised, till at 220° C. it becomes nearly black and as viscid as thick treacle. Heated still further, the liquid loses its viscosity and boils at 446° C. If the S. be then poured into cold water, it will form into tough elastic semi-transparent strings, the colour of which varies from a pale amber to a deep brown, according to the temperature of the previous liquid, the higher the temperature the darker the colour. If kept for a day or two, this modification of S. gradually becomes yellow, opaque, and brittle. If S. at 120° is poured into water, it falls in isolated drops, solidifying into yellow crystallised buttons of ordinary S. If S., heated till it is completely melted, is allowed to cool slowly, it forms into oblique prismatic crystals, of a transparent yellow hue, differing markedly from ordinary yellow octohedral S. Thus, prismatic S. fuses at 120° C., 5° higher than the corresponding temperature for octohedral S., while the specific gravities of these varieties are respectively 1·98 and 2·05. The prisms obtained by fusion gradually change to an opaque yellow, the particles of S. at the same time arranging themselves into minute octohedra. This structural change is accompanied by the evolution of heat. A fourth amorphous form of S., insoluble in bisulphide of carbon, is obtained as a grey, powdery-residue, when the hard solid mass which results from the cooling of the viscous S. is placed in bisulphide of carbon. All these forms may be distilled, and the distilled S. thus obtained is identically the same, whichever allotropic modification may have been used.

S. forms sulphides or sulphurets with hydrogen and the metals, corresponding in composition to the oxides. *Sulphuretted hydrogen*, or sulphide of hydrogen (H_2S), has already been mentioned as occurring in certain mineral waters. It has the characteristic odour of rotten eggs, from which it is evolved. For laboratory purposes, it is easily prepared by acting upon certain metallic sulphides with a strong acid; for instance, the sulphide of iron with sulphuric acid. Its solution is a useful test in analysis for certain metals, whose sulphide or hydrated sulphide is precipitated from the acidulated solution of the metallic salt which is being investigated. Among these are silver, bismuth, mercury, lead, copper, gold, platinum, tin, antimony, and arsenicum. The bisulphide of carbon (CS_2) is prepared on a large scale by driving S. vapour over glowing coke, and condensing in cooled receivers. It is a poisonous volatile liquid, boiling at 48° C., and giving off an extremely inflammable vapour. It is insoluble in water, but is itself a powerful solvent for oils and fats, and for S., iodine, bromine, and phosphorus. It has never yet been solidified. It combines with metallic sulphides, and forms unstable sulphocarbonates, analogous in constitution to the carbonates. S. forms two compounds with chlorine (S_2Cl_2 and SCl_2), both of which are decomposed by water. The former is a yellow liquid, the latter a red fuming liquid. With oxygen, S. forms two important compounds, sulphurous anhydride (SO_2) and sulphuric anhydride (SO_3). The former has been already mentioned as the sole product of the combustion of S. in air; but it is generally obtained by heating copper with sulphuric acid, when water and the cupric sulphate are obtained, and the heavy pungent gas given off ($2H_2SO_4 + Cu = CuSO_4 + SO_2 + 2H_2O$). It may be condensed to a clear liquid at − 10° C., and solidified at − 76° C. It is uninflammable, and readily extinguishes flame. In the arts, sulphuric anhydride is largely used as a bleaching agent for silk, straw, wool, &c., which would be injured by the more powerful bleaching agent, chlorine. The colour so destroyed may be restored by the action of an alkali or a stronger acid. Another of its uses depends upon its antiseptic properties, so that it is employed to check fermentation in cider and home-made wines. Sulphuric anhydride is also formed as a stage in the manufacture of sulphuric acid from iron pyrites, but is here mixed with a large proportion of nitrogen. Sulphurous acid (H_2SO_3), the solution of sulphurous anhydride in water, furnishes a series of salts known as the sulphites. According as the metal replaces one or both of the hydrogen atoms, we have the bisulphite or sulphite respectively. The sulphite of soda ($Na_2SO_3 10H_2O$), used by paper-makers as an *antichlore* in bleaching, is the most important, and is usually prepared by passing sulphurous anhydride over damp crystals of carbonate of soda, carbonic acid being evolved. *Sulphuric anhyride* (SO_3) may be prepared by bringing sulphurous anhydride and oxygen in a tube in the presence of heated platinum or certain metallic oxides, such as cupric or chromic. Its hydrate (H_2SO_4), known as *sulphuric acid*, is the most important of all acids, and is the basis of our chemical manufactures. It was discovered more than four centuries ago by the alchemist Basil Valentine, who obtained it by distillation of dry sulphate of iron or *green vitriol*, and called it *oil of vitriol* from its oily appearance. Thus prepared, the distilled liquid is a mixture of sulphuric acid and sulphuric anhydride, which latter may be partly disengaged by gentle heating, and is altogether expelled at 338° C., the boiling point of sulphuric acid. Thereafter the whole distils over without alteration. The distillation of sulphate of iron for the manufacture of sulphuric acid has been long conducted at Nordhausen in Saxony, and hence sulphuric acid so prepared is generally called Nordhausen sulphuric acid, and is readily distinguished by its fuming character from the English sulphuric acid, which is manufactured in a very different way.

In making sulphuric acid upon a large scale, sulphurous anhydride is first obtained by burning S. or iron pyrites in a current of air. The stream of heated gases then passes over a mixture of sodic nitrate and sulphuric acid contained in an iron pot, from which arise vapours of nitric acid. The mingled gases next pass into immense sheet-lead chambers, the bottom of which is covered with a shallow layer of water. The following action then takes place:—The sulphurous anhydride is dissolved, and the sulphurous acid quickly reduces the nitric acid to nitric oxide (NO), becoming itself oxidised to sulphuric acid. The nitric oxide, however, at once combines with the free oxygen present in the chambers, and becomes the peroxide of nitrogen (NO_2) which, in the presence of sulphurous acid and water, is speedily reduced to the nitric oxide again. Thus the series of reactions goes on until nothing but nitric oxide and nitrogen are left, and these pass off into the air by a flue. The sulphuric acid collected at the bottom of the chambers is concentrated by evaporation in shallow leaden pans till its specific gravity is 1·72. It is then the *brown* sulphuric acid of commerce, largely employed in making manures, and in Soda Manufacture (q. v.). Its further concentration is conducted in glass or platinum stills. At 338° C. it boils, has the composition H_2SO_4, and in this form can be no further reduced by heating. Its specific gravity is 1·842. It is a dense, oily, colourless, odourless liquid, is intensely caustic, and has a powerful attraction for moisture. When it is mixed with water, much heat is evolved. It is a strong acid, and forms an important series of salts called the sulphates, the chief of which are more specially considered under the corresponding metal.

Medicinal Properties of S. and its Compounds.—S. is officinal in three forms—namely, *S. sublimatum*, or flowers of S.; *S. lotum*, or washed S.; and *S. præcipitatum*, or precipitated S. S. is soluble in

the alkaline juices of the intestines, is capable of absorption, and has been detected in the milk, sweat, urine, and even in the breath. S. acts as a mild laxative, accompanied generally with much offensive flatus of sulphuretted hydrogen. Under its continued use the secretions are slightly increased, and it acts specially upon the skin and mucous membranes. S. is prescribed as a laxative in cases of hæmorrhoids and of chronic rheumatism; and as an alterative in sciatica, lumbago, and other varieties of muscular rheumatism, as also in various cutaneous affections. In the form of natural S.-waters, S. is used externally and internally in both rheumatic and skin diseases. S. is also used as a specific in cases of Itch (q. v.).

Sublimed S. may be given in doses of from 20 to 60 grains or more, as a laxative, in treacle or milk. The pharmaceutical preparations are *Confectio Sulphuris*, composed of sublimed S., 4 parts; acid tartrate of potash, 1 part; and syrup of orange peel, 4 parts;—dose, 60 to 120 grains. *Unguentum Sulphuris*, composed of sublimed S., 1 part, and benzoated lard, 4 parts. A S. electuary, known popularly as 'The Chelsea Pensioner,' consists of S., 6 parts; mustard, 6; powdered guaiacum, 3; rhubarb, 1½; nitre, 1½; with honey or treacle sufficient to make it into an electuary;—dose, a teaspoonful every alternate evening in cases of rheumatism.

Medicinal Properties of Sulphuric Acid.—Sulphuric acid is used in medicine externally and internally. Concentrated sulphuric acid is powerfully corrosive both of animal and vegetable tissues, abstracting the water and leaving the carbon untouched. When taken internally, sulphuric acid is absorbed into the blood, and is supposed to be converted into sulphates, and as such is eliminated by the lower bowel, the skin, and the kidneys. *Concentrated* sulphuric acid, mixed with finely-powdered charcoal so as to form a paste, is used as an escharotic; *diluted*, it is used as a stimulant and astringent in venereal and other indolent ulcers. *Internally*, sulphuric acid is prescribed in cases of night-sweats, and in profuse serous diarrhœas, and as a curative and prophylactic agent in cases of cholera. In cases of acute Lead-Poisoning (q. v.) sulphuric acid is an efficient antidote. Cases of accidental poisoning by sulphuric acid are not uncommon, and when such do occur, the best antidotes are chalk, magnesia, white-wash, and soap, which should be given freely in milk or water. Christison condemns the use of alkaline carbonates as in themselves irritating, but they may be given in cases of emergency.

Medicinal Properties of Sulphurous Acid.—Sulphurous acid is a powerful deoxidising, disinfecting, and antiseptic agent, and is most efficient in destroying the low forms of life which are connected with putrefaction and fermentation. It is a valuable agent for disinfecting purposes. In the form of spray, or as a lotion, sulphurous acid is applied in cases of diphtheria, sore-throat, bronchitis, wounds, ulcers, bed-sores, and burns, and also in cases of parasitic diseases of the skin. Sulphurous acid combines with bases, forming sulphites, bisulphites, and hyposulphites, which are used for similar purposes as sulphurous acid.

Sul'tan (Arab. 'power' or 'prince,' from *salita*, 'to be strong'), a title borne by various Mohammedan monarchs, *e.g.*, of Borneo and Zanzibar, but specially by the ruler of the Ottoman Empire, the *Sultân as-salâtin*, 'ruler of rulers.'

Sultanpore' (*Sûltânpûr*), the chief town of the district of the same name in Oude, British India, on the Gumti River, 92 miles S.E. of Lucknow, and 59 N. of Allahabad. Pop. (1869) 5708. It was formerly the capital of the Bhars, an aboriginal tribe expelled by the Mohammedans, but it is now decaying. The military cantonments lie on the opposite side of the river. During the Mutiny of 1857, the sepoys rose and murdered their officers and the civil officials, but the women had been sent beforehand safe to Allahabad. The *district* of S., which stretches S. along the Gumti River, has an area of 1701 sq. miles; pop. (1869) 1,000,336. The products are wheat, rice, and inferior grains.

Sulu' Islands, an archipelago of 150 small islands, extending from Borneo to Mindanas, and having an aggregate area of 977 sq. miles, and a pop. of 200,000, who are mainly Malays, much given to piracy. The chief island, Cagayan-Sulu, is 36 by 12 miles, and contains Soog (pop. 8000), the sultan's residence, and the great slave-market of Malaysia. The S. I. yield rice, sugar, coffee, spices, teak, &c. The sultan, who is independent, and also holds the S. half of Palawan and the N. part of Borneo, contracted a treaty of protection with a European power in 1878.

Su'mach (*Rhus*), a genus of shrubs or trees with a resinous, sometimes viscous-milky, often caustic juice, widely distributed through the temperate countries of both hemispheres (especially plentiful at the Cape and in N. America), more sparingly within the tropics, and absent from Australia. Most of the species possess poisonous properties; some yield valuable economic products. *R. Coriaria*, the tanner's S., is a shrub or small tree of countries round the Mediterranean and Persia, and is cultivated on a large scale in Sicily for its leaves—known commercially as S. For the first year's gathering the leaves are hand-picked from the carefully pruned young plants of the S. plantation; in subsequent years they are removed attached to the cut branches, which after being dried are threshed, and the leaves are either packed whole, or are ground into powder in a vertical mill. S. is employed extensively for tanning the finer kinds of leather, and has been so used for a long period. The leaves and twigs, fruit and roots, and the bark, furnish black, red, and yellow dyes; the acid fruit is eaten as a condiment by Turks and Persians; and the seeds and leaves are used medicinally. In 1877 the S. imported into Great Britain amounted to 13,409 tons, valued at £224,862, of which Italy alone sent 11,994 tons. *R. cotanus*, called Venetian S., Scotino, and the wig-tree (from the mass of abortive pedicals resembling a white wig), is also a Mediterranean species, extending eastwards (as *R. velutinus*) to the Himalayas. It furnishes the 'young fustic' of commerce. (See FUSTIC.) The crimson downy fruit of *R. glabra* of N. America is officinal in the United States pharmacopœia, as producing a cooling drink; its acidity is due to malic acid and bimalate of lime. *R. tiphina*—the staghorn S.—also N. American, extending N. to Canada, yields from incisions in the bark a kind of copal; the leaves can be used like ordinary S. for tanning. Of *R. semialata*, a native of India, China, and Japan, the fruit-pulp is used in medicine, and galls peculiar to this species are an article of trade. *R. succedanum* is a tree of the same three countries. In Japan its seed is crushed, boiled, mixed with the fruit of some other tree (species not known), and pressed while hot. The result is a beautiful vegetable wax of snow-white colour, from which candles are made. This substance has been introduced into the English market, and it has given to the tree the name of the 'Japan wax-tree.' The 'Japan varnish-tree' (*R. Vernix* of Linnæus) yields the famous lacquer so extensively employed in that country for lacquering articles of furniture, &c. It exudes as a milky-white juice from wounds made in the tree, becoming ultimately black by exposure. The juice of the leaves of this species is highly corrosive, blistering the skin in a dreadful manner; great caution is therefore necessary in collecting the varnish. Candles are made of the wax surrounding the fruit. Of other poisonous species the best known are *R. toxicodendron* and *R. venenata*—the 'poison oak' and the 'poison ash' of N. America. The first, with its variety *R. radicans*, occurs in moist woods from Canada to Carolina, westwards to the Rocky Mountains; the second grows on the margin of swamps from New York to Georgia. Both are very poisonous to persons of peculiar constitutions, causing painful distress even by their emanations, and if handled, resulting in 'swelling of the hands, arms, or sometimes the whole body, accompanied with intolerable pain and inflammation, and ending in ulceration.' Tincture of lobelia allays the irritation. The leaves of *R. toxicodendron* have, however, been used in palsy and cutaneous diseases, and it supplies a homœopathic medicine for rheumatism.

Sumar'okof. See RUSSIAN LANGUAGE AND LITERATURE.

Sumat'ra (Arab. *Srimata*, 'the happy'), the third largest island in the world and the most westerly of the Sundas, is separated by the Strait of Malacca from the Malay Peninsula, from which it stretches in a south-easterly direction, extending for an almost equal distance on either side of the equator. Area, 169,538 sq. miles; pop. estimated at 2,000,000, comprising, besides the native Malays, some Chinese and other Asiatics, and 25,000 Europeans, mostly Dutch. With an extreme length of 1040 miles and a breadth of 265, S. is traversed by a mountain range, the Boukit Barissan, which culminates in Mount Ophir, or Telaman Peak, 9655 feet high, nearly under the equator. This chain runs nearer the W. than the E. coast, and is connected by lofty plateaux with a lower lateral range. The only true highland region in S. lies near its centre, where several ranges converge, and where there are at least six volcanoes. This central region was explored by an expedition despatched in

May 1877 by the Dutch Geographical Society, and its mountains were found to be covered with dense vegetation. Spurs from the main ridge in various places reach the W. coast in beetling cliffs, but for the most part the coast-lands are low, alluvial plains, densely covered with jungle. The geology is wholly unlike that of Java, the prevailing rocks being granite, syenite, gneiss, mica slate, and red sandstone. There are many fine lakes, of which the largest, Singkarah or Sarawang, in Upper Padang, has a length of 17 miles. In the S.E. the island is specially rich in streams, some of which are navigable far inland even for large vessels. These streams, which carry down large quantities of mud, are linked together by natural branches and artificial cuttings, and on their banks, amid luxuriant vegetation, stand the towns and villages. Like Java and Borneo, the level of the whole island is slowly but steadily rising. Except in the malarial plains along the W. coast, the climate is considered healthy. On the coast the heat varies from 82° to 86° F., and in the highlands from 64° to 73° F. at an elevation of from 2500 to 3000 feet. While the monsoons are somewhat irregular, the dry seasons lasts N. of the equator from October to May, and S. from April to October. The natural products of S. are more varied than those of any other island in the archipelago. Its minerals comprise gold, iron, copper, tin, brown coal, &c., and its vegetable growth is specially exuberant. Rice is the chief food, then sago, beans, and roots. The palatable fruits include the mangosteen, durian, rambutan, rambei, guava, citron, orange, lemon, bread-fruit, pomegranate, melon, and pisang; and many of these cannot be acclimatised elsewhere. The *Sideroxylon* (*Kayu-besi*, 'iron-wood'), an admirable substitute for teak, yields the best timber for shipbuilding. There are many varieties of palms as well as satin-wood, ebony, Djati (*Tectona grandis*), the silk-cotton tree, &c. Chief among the commercial plants are cotton, black pepper, caoutchouc, benzoin, guttapercha, various dyestuffs, and camphor. The forests are luxuriantly festooned with many-hued parasites, of which perhaps the most interesting is the unique Rafflesia (q. v.). The Dutch have introduced coffee, tobacco, cacao, and nutmeg, but the plantations of the last do not thrive. The fauna includes the elephant, rhinoceros, tiger, panther, bear, and tapir. Other animals in S. are the orang-outang and other apes, the buffalo, a small hill-horse, goats, sheep, peacocks, and pheasants. The rivers, in which are found the hippotami and crocodile, abound in salmon and other fish. Besides rice, S. exports pepper (from Atcheen alone 7000 tons), benzoin, gums, resins, rattans, cottons, dyestuffs, tobacco, ivory, edible nests, &c. In 1876 there were 1261 miles of telegraph throughout S., and 64 miles of submarine cable connecting it with Java. The Dutch now possess more than half the whole area, with a pop. of 1,630,000. This part consists of the government of the W. Coast, with its capital Padang (q. v.), the Residencies of Bencoolen (q. v.), Lampong, and Palembang (q. v.). Holland also exercises authority over the kingdoms of Jambi, Indragiri, and Siak, and the minor states of Arsahan, Deli, Serdang, &c., on the E. coast. Independent states are Atchin (q. v.), Battak, and Korintji; the natives of the last two, though cannibal, are peaceful and enterprising. S. is regarded as the cradle of the Malay race, and the uncivilised Orang-Koabos, who live in a primitive manner in the forests of the N.W. of Palembang, are probably a remnant of the aborigines. The Malays, who are Mohammedans, write their sonorous language with Arabic letters, and have a comprehensive literature. The Battaks are fetish-worshippers. The remains of Hindu temples, and the presence of Sanskrit words, indicate that the relation with India must formerly have been intimate. Marco Polo landed here in 1290, and was followed by the Portuguese under Alvarez Talesso in 1506, and by the Dutch in 1597. The English held possessions on the W. coast, which were returned to the Dutch in 1783; they again occupied part of S. from 1811 to 1824. The Dutch extended their hold greatly in 1819-45, and by a war with Atchin, 1839-40, made that state an inveterate enemy. The wording of the treaty of 1824 left it uncertain whether England could lay claim to Atchin, but when all dubiety was removed by the treaty of 1871, the Dutch at once declared war against the natives on account of maladministration and piracy. The war, unsuccessful at first, has been carried on with great vigour since Van Swieten received the command in 1873, but the country has not yet been subdued (December 1878). See Müller, *Bydragen tot de Kennis van S.* (Leyd. 1846); Ridder de Stuers, *Vestiging en uitbreiding der Nederlanders ter Westcust van S.* (Amst. 1849); and Petermann's *Mittheilungen* (January and July 1878).

Sumba'wa, one of the lesser Sunda Islands, to the E. of Java, is separated in the W. by Allass Strait from Lombok and on the E. by Sappi Strait from Flores. Estimated area, 6000 sq. miles; pop. 90,000. It is mountainous and volcanic, and yields gold, sulphur, saltpetre, rice, Indian teak (*Tectona grandis*), sapanwood, tamarinds, and a fine breed of horses. The volcano Tamboro, which is still active, burst forth on the 11th April 1815, spreading desolation on every side. The mountain sank from 14,000 feet to 8940, the sea rushed inland, ashes were thrown as far as Sumatra, 840 miles distant, and the number of lives lost is variously estimated at from 12,000 to 42,000. Other but less deadly eruptions took place in 1836 and 1860. S. is divided into six native states under Dutch authority—namely, Tamboro and S. in the N., Bimba in the E., where the Dutch governor resides, and in the S. and W. Dompo, Papekat, and Sangar—whose inhabitants, closely allied to those of the Celebes, are peaceful and industrious.

Sumbulpur' (*Sambalpur*), the chief town of the district of the same name, Central Provinces, British India, on the left bank of the Mahanuddi river, 340 miles E. of Nagpur; pop. (1872) 11,020. The town has lately been much improved. It contains several old temples.—S. *district*, which occupies the extreme E. of the Central Provinces, has an area of 4407 sq. miles; pop. (1872) 523,034. In 1875-76 the exports were valued at £33,000, chiefly piece-goods, lac, salt, opium, and spices; and the imports at £39,000, chiefly rice and other grains, sugar, country cloth, metals, *ghee*, and oil. The only manufacture is the weaving of tussar-silk cloth. The climate is unhealthy. S. forms the centre of a numerous group of feudatory states, of which Kharond is the chief. The direct line of the old Rajahs of S. expired in 1849, when the country was annexed.

Summ'ary Dil'igence, in Scotch law, means issuing execution on a legal document without previous action, as on a bill of exchange by notarial protest.

Summ'er Duck (*Aix sponsa*), a species of American Duck (q. v.) very common in the United States, allied to the Mandarin duck, or Chinese teal (*Aix galericulata*), the colour of the plumage being very similar in summer. The hinder toe is not united by membrane to the other toes. The S. D. perches on trees, like the Chinese teal, and appears to make its nest in tree hollows. It migrates southwards in winter.

Summ'er Islands, a group of twenty islets off the W. coast of Scotland, near the mouth of Loch Broom, an inlet in Ross-shire. The largest, Tanera, is 2 miles long, and has about 100 inhabitants. The others are tenantless.

Summ'ons, in the United Kingdom, is a legal writ directed to a party, calling on him to appear in court, to answer to some charge. In criminal cases, the writ is called a Warrant (q. v.).

Sum'ner, Charles, an American statesman, born at Boston, 6th January 1811, graduated at Harvard in 1830, studied law under Judge Story, and was admitted to the bar in 1834. He edited the *American Jurist*, published 3 vols. of Story's *Decisions*, lectured on law at Harvard in 1835-37 and again in 1843, and annotated Dunlop's *Admiralty Treatise* (1836). He never acquired or even sought much bar practice, and spent the years 1837-40 in a European tour, being received with flattering distinction in England, France, and Germany. On his return he edited, together with J. C. Perkins, 20 vols. of Vessey's *Reports*, and in 1845 delivered the Boston Fourth of July oration, which Cobden pronounced 'the noblest modern contribution to the cause of peace.' His protest against the admission of Texas to the Union (1845), and opposition to the subsequent war with Mexico, turned the tide of his popularity, and his desertion of the Whigs for the Free-Soil party, which he helped to form, led to a determined effort on the part of his opponents to 'crush him, socially and professionally.' But fearlessly he took up a decided anti-slavery position, and by a Free-Soil and Democrat coalition was elected senator for Massachusetts in 1850. In 1852 he began his anti-slavery crusade with an argument for the repeal of the Fugitive Slave Law, and a phrase in the speech, 'freedom national—slavery sectional,' became the watchword of his party. In his able two-days' speech on 'The crime against Kansas' (1856) he made a gross attack on several

senators, on account of which he was challenged but refused to fight, and eventually, after due warning, was severely caned in the Senate by Preston S. Brookes. S. now became the martyr of Abolition, and was applauded in New England and fêted and caressed in Europe, where he sought repose during an illness which lasted nearly four years. He had been unanimously re-elected by Massachusetts in 1857, and returned again in 1863. He spent his last 23 years in active Senatorial warfare. Chairman of the Committee on Foreign Relations from 1861 till 1871, he was the actual leader of the Senate for many years, and as such he opposed the renomination of Grant, and gave his support to Horace Greeley. Having led the Republicans into some of their wildest schemes, in particular having projected the Civil Rights Bill (1873), which attempted to force personal association and social equality with the negro on the Southern people, S. quarrelled with his party on issues never distinctly understood, but well known to arise out of disappointed personal ambition rather than political difference. Keen in debate and pure in motive, he was certainly ill-treated by the party which his passionate temper was constantly endangering. He died 11th March 1874. His Collected Works were published at New York in 12 vols. 1870 *et seq.* See *Memoir and Eulogies*, edited by Dr. Cornell (Bost. 1874), and *Memoir and Letters* by E. L. Pierce (2 vols. Lond. 1878).

Sump'tuary Laws, designed to restrict private expense (Lat. *sumptus*) in matters of food, apparel, &c., were passed in Greece by Lycurgus (*circa* 850 B.C.), and Zaleucus (450 B.C.); whilst at Rome the chief enactments of the kind were the Lex Oppia (213 B.C.), Lex Orchia (181 B.C.), Lex Fannia (161 B.C.), Lex Æmilia (78 B.C.), &c. In England S. L. commenced with 37 Edward III., and ended with 1 Philip and Mary, since which time political economy, confining the action of government to the protection of life and property, has left the individual free to decide in matters solely relating to himself. Hallam has pointed out that while the kings of France and England multiplied laws about the food and dress of their subjects, they were themselves more egregious spendthrifts than any others in their dominions, and contributed far more by their love of pageantry to excite a taste for dissipation in their people than by their ordinances to repress it (*Middle Ages*, ch. ix. part ii.).

Sum'ter, Fort, a strong fortification constructed on a shoal on the S. side of the entrance to the inner harbour of Charleston, S. Carolina, notable as the scene of the first conflict in the American Civil War. On the formal secession of S. Carolina, December 20th, 1860, F. S. was occupied on behalf of the United States Government by Major Anderson with two companies of artillery, amounting in all to 75 men. The fort was at once blockaded by the Confederates, but the little garrison held out until the month of April. On the 12th of that month fire was opened upon the fort by the Confederate artillery; on the afternoon of the 13th terms were arranged; and on the 14th the garrison marched out with the honours of war. Sherman in turn forced the Confederate garrison to evacuate the fort, and the United States flag was again hoisted, April 14, 1865.

Su'my, a town of Russia, government of Kharkov, on the Psol, a feeder of the Dnieper, 92 miles N.W. of Kharkov. It has a great annual fair. Pop. (St. Petersb. Cal. 1878) 14,126.

Sun, The, to an observer on the earth, has two apparent motions, which are caused respectively by the earth's rotation on its axis and its revolution in its orbit. The former diurnal motion is common to all celestial objects; the latter annual motion is peculiar to the S. In virtue of it, the S. appears to describe a great circle in the heavens known as the Ecliptic (q. v.), passing in regular succession through twelve arbitrarily chosen portions called the signs of the Zodiac (q. v.). In reality, it is the earth which moves in an elliptic orbit round the S. which occupies a focus. See ELLIPSE. The semi-major axis of the orbit or the mean distance of the S. from the earth is, according to the latest results, about 92,400,000 miles; and the eccentricity is ·0167712 of this semi-major axis. To determine as accurately as possible this mean distance is one of the most important problems in astronomy, and has occupied the attention of astronomers of all ages. It is the astronomical unit, in terms of which all other great astronomical distances are expressed; and these cannot be absolutely known till it is. This distance, however, is so great compared to the earth's radius, that the sun's parallax, *i.e.*, the angle which the earth's radius would subtend to an observer on the S., is far too small to be directly measured. In fact, the difference in the apparent positions of the S., as viewed by two independent observers at the extremities of the longest possible base-line, the earth's diameter namely, is barely appreciable to our most delicate modern instruments, infinitely less so to the naked eye, to which the ancient astronomers could alone trust. Consequently the estimates of Aristarchus and Ptolemy were very erroneous, and far too small. Kepler and his contemporaries were fully aware of this, but could only guess at the value. Huyghens, calculating what the apparent diameters of Venus and Mars would be as viewed from the sun, and assuming the earth's apparent diameter to be intermediate to these, deduced 99,000,000 of miles as the sun's distance—a remarkably close approximation. Not till 1672, however, was a really trustworthy estimate made, by observation of Mars during its opposition. The *relative* distances of the planets from the S. are easily obtained by means of Kepler's laws, so that if the parallax of one of the nearer planets can be directly determined, the parallax of the S. follows immediately. Mars and Venus, when they come nearest the earth, are the only really suitable planets for the purpose. Now Mars is nearest at opposition, and Venus when it is between the earth and S. In this position, however, Venus is generally invisible, unless it happens to come exactly in the line of the earth and S., when it will appear as a round black spot upon the sun's disc. This *transit* of Venus occurs only four times during 243 years, and consequently, this being the most accurate method we have for directly determining the sun's distance, the importance of carefully observing the phenomenon cannot be over estimated. From the transit of 1769, Encke in 1824 calculated 8″·57 as the solar parallax, a value which passed unquestioned for 30 years, when Hansen, to account for discrepancies in his lunar tables, had to increase the parallax by 1-30th of its entire amount. The observations of the 1874 transit have not yet been reduced; but the conclusion that Encke's distance is too large is supported by the values deduced from recent oppositions of Mars, the Aberration (q. v.) of the stars, and the velocity of Light (q. v.). According to Newcomb, the most probable value of the sun's parallax is between 8″·82 and 8″·86. Taking the sun's distance then at 92,400,000 miles, its mean apparent diameter (32′ of arc) gives 860,000 miles as its absolute diameter. In volume it is equivalent to about 1¼ million times the volume of our earth; but its mean density is only ¼ of that of the earth. It rotates round its axis in from twenty-five to twenty-six days, as is shown by the motion of the *spots*, which are rarely absent from its face. These spots were first observed by Fabricius of East Friesland (1611), and by Galileo (1612), and made the object of continuous scrutiny by Schwabe (1826-51), who established a periodicity in their frequency. Every ten and a half years the frequency of S.-spots attains a maximum, falling off during the interval to a minimum, from which it recovers gradually to the next maximum. This S.-spot periodicity has become of great interest within late years, from its probably intimate connection with meteorological phenomena. There seems no doubt that the frequency of magnetic disturbances and auroras follows the same periodic law, corresponding in its maxima and minima to that of the S.-spots; and there is a strong probability that Indian famines and tropical cyclones, and even commercial crises in this country (see *Nature*, vol xix., November 14, 1878), are subject to exactly the same periodicity. When it is borne in mind that the S. is the great source of heat and light, without which atmospheric changes would be very limited, and life, as we know it, would be impossible, such a connection need surprise none; while to characterise attempts to establish such a connection as an absurdity is, to say the least, essentially unscientific. The spots consist usually of two parts, a dark central portion (the *umbra*), surrounded by a brighter annular portion (the *penumbra*). They assume the most fantastic shapes, and are frequently many thousands of miles in diameter. Before discussing their nature, however, we must first consider the composition of the S., as revealed by the spectroscope.

Of the dark lines which cross the solar spectrum (see SPECTRUM ANALYSIS), a few, as proved by Brewster, are due to absorption by our own atmosphere; but the vast majority are truly solar, caused by the absorptive action of the gases constituting the outer and cooler envelope of the S. upon the light emitted by the *photosphere*, the name given to the luminous uniform disc upon which the spots appear. The continuous nature of the spectrum proves the S. to be a glowing opaque body, probably

highly compressed gas; and from the absorption lines we learn that the outer envelope of gases is composed of hydrogen, nitrogen, and the vapours of iron, nickel, cobalt, copper, sodium, potassium, lithium, calcium, barium, magnesium, chromium, manganese, titanium, &c., probably arranged from within outwards to a certain extent according to their densities. At a total eclipse, the outer stratum of the envelope from which spring the rose-coloured protuberances which fringe the moon's dark limb is visible, and gives a spectrum consisting of three bright lines. These lines, two of which corresponding to hydrogen, and one to an unknown substance called provisionally *helium*, appear as absorption lines in the sun's spectrum; and this *reversal* at the moment of totality, proves the *chromosphere*, as Lockyer calls this outer shell, to be self-luminous. After totality had ceased at the eclipse of 1868, Janssen, who was stationed in Further India, continued to see these bright lines in relief against the solar spectrum. That this should be possible had been concluded by Lockyer two years before, but for want of a suitable spectroscope he had been unable to *see* the bright lines until a few weeks after Janssen had seen them. By employing a sufficiently dispersive spectroscope, the continuous spectrum is drawn out with growing faintness, while the bright chromosphere lines are simply displaced without fading, so that they are at length made to stand out against the fainter background. The protuberances or flames are now a subject of continual study to solar spectroscopists. Outside this chromosphere lies the *corona*, a silvery luminosity which is only visible during total eclipses as a solar appendage. It gives a faintly continuous spectrum crossed by several *bright* lines; and hence the corona shines partly by reflected light, partly by self-luminosity. One of these bright lines (in the green) is persistent at distances from the sun at which the others (the hydrogen lines) have disappeared, so that here we have an unknown substance lighter and even simpler optically than hydrogen. The behaviour of the spots as viewed by the spectroscope is very extraordinary. It is impossible here to enter into details: enough to say that these spots are more absorptive than the photosphere generally, and that the vapours which fill the contiguous region are subject to rapid motions, as proved by the displacement of the spectrum lines (see STARS). In certain cases a rapid downrush of colder gas has been accompanied by as rapid an uprush of warmer gas, so that in S.-spots we have probably grand cyclonic storms, an hypothesis supported by the fact that the spots are very much restricted to two zones lying near the equator on opposite sides of it. A word in conclusion as to the source of the S.'s radiant energy. It is, of course, a cooling solid, whose high temperature has been due partly to its contraction from its probably original nebular condition, partly to the incessant rain of meteors which pour upon it from all sides. Tracing its life-history backwards, we see it growing and growing in dimensions until it embraces the whole system in the nebular unity from which it has developed. From the general discussion of the proper motions of the fixed stars, it has been established by Herschel, Struve, and others, that the S. has a definite motion in space towards the region at present occupied by the constellation Hercules. The chief authorities on the subject are *Researches in Solar Physics*, by Balfour Stewart, De la Rue, and Loewy (1865-66); *The S.*, by Proctor (1871); *Solar Physics*, by Lockyer (1874); and *Le Soleil*, by the late Father Secchi (1875-77). See also Tait's *Recent Advances* (1876) and Newcomb's *Popular Astronomy* (1878).

Sun and Fire Worship is one of the principal and earliest forms of nature worship. When Divine powers came to be imagined as personages, fire, which attracted man's attention both by its mysteriousness and its usefulness, was one of the first to be personified. It is the god Agni (*agni*, Lat. *ignis*, from root *ag*, 'to shine') of the Vedas, which contain the earliest religious conceptions on record. In the same way the sun was personified and worshipped as a sun-god, who is one of the principal deities in almost all primitive religions, *e.g.*, the Hindu Indra, Egyptian Osiris or Serapis and Ra, Greek Apollo, Helios, Dionysus, and Herakles, Roman Janus and Bacchus, Phœnician Baal and Adonis, Syrian Tammuz, Semitic Molech, Milcom, Babylonian Izdubar, Ur-bel, and Sandon, Scandinavian Odin, &c. But some nations continue to worship the shining orb of the sun and fire without the intervention of any deity. The sun was worshipped in this way notably by the ancient Peruvians and Mexicans, and fire by the ancient Persians. See PARSEES, M. Müller, *Introd. to the Sci. of Rel.* (Lond. 1873); Cox, *Myth. of the Aryan Nations* (Lond. 1870).

Su'nart, Loch, an arm of the sea in the W. of Argyllshire, extending E. from the Sound of Mull for 18 miles, with a breadth of from 3½ miles to ⅗ths of a mile.

Sun Bird (*Nectarinia*), a group of *Tenuirostral* birds, occupying in the Old World the place of the Humming Bird (q. v.) in the New World, and rivalling the latter in the iridescent glow of its plumage. It feeds on insects and flower-juices. The female loses its brilliant plumage after the breeding-season. Of the group the fiery-tailed S. B. (*N. ignicauda*) of India, the greater collared S. B. (*N. afra*), the collared S. B. (*N. Chalybeia*), the Javanese S. B. (*N. Javanica*), and blue-headed S. B. (*N. cyanocephala*), are familiar species.

Sun'da Islands, a large group in Malaysia, comprising Sumatra (q. v.), Java (q. v.), Timor (q. v.), and a chain of smaller islands stretching between the last two, belonging almost entirely to the Dutch. The Sunda Sea, between Java and Borneo, is connected with the Indian Ocean by the Sunda Strait, a channel about 90 miles wide, separating Java from Sumatra.

Sun'day. See SABBATH and LORD'S DAY.

Sun'day-Schools at first were simply schools meeting on Sunday, differing in nothing from other schools except that they assembled on the first day of the week; gradually, however, instruction came to be confined to the Bible, teachers ceased to be paid, and the organisation became a branch of the general Christian system for providing the people with religious instruction, as affording a means for systematic catechising on the truths of Scripture.

I. *History.* (1) *The United Kingdom.*—Though individuals at all times of the Church's history arose here and there to give instruction to children in Bible truth on Sundays, of whom Cardinal Carlo Borromeo of Milan is perhaps the most celebrated, S.-S. as an *organised* Christian effort for the religious education of youth owe their origin to Robert Raikes (q. v.). In 1803 the Sunday-School Union, chiefly composed of Dissenters, was formed; it was followed in a few years later by a similar Church Society. In Wales S.-S. were introduced in 1785 by the celebrated Methodist preacher Charles, and produced the insatiable demand for Bibles in the vernacular which led to the formation of the British and Foreign Bible Society in 1804. In Scotland the system of family catechising had already provided in large measure for the adequate training of the young, but as early as 1782 some ladies set up a small school on Raikes' principle, and in 1797 a gratis Sunday-School Society was formed in Edinburgh. For many years S.-S. were much opposed by the Church authorities; but at length the great name of Chalmers won credit for the system, and the high standard of religious knowledge characteristic of the country soon showed its influence in the zeal and efficiency of the Sunday-school teachers. In Ireland, S.-S. were introduced in 1786, and a Sunday-School Society established in 1816. According to the last returns (1878), the number of children under instruction in S.-S. in Scotland are 407,329, with 44,591 teachers. For England and Wales the figures (1876) are, for the Sunday-School Union, 951,000 scholars, and 103,600 teachers, and for the Church of England Sunday-School Institute, scholars 314,298, and teachers 28,875.

(2) *The United States.*—S.-S. were introduced here as early as 1786, and five years later the first society was established at Philadelphia, under the presidency of Bishop White. In 1803, three ladies opened the first Sunday-school in New York city, which led to the formation in 1816 of the New York Sunday-School Union, and ultimately in 1824 to that of the American Sunday-School Union, whose 63,793 schools had 2,745,610 pupils, and 419,796 teachers in March 1876. The peculiarities of the American Sunday-school system are best seen in the far western States. There, as soon as a small settlement of three or four families is formed, a Sunday-school is set up. This forms a rallying-point for any religious zeal there may be in the little community; and as the settlement grows so does the Sunday-school, till the people are numerous enough and rich enough to build a church and call a pastor. But still all classes and all ages continue to attend the Sunday-school, by means of which the minister gets more directly at his people, and the people become more

intimately associated with each other. More or less this description holds true of all American S.-S., the interest in which is kept up throughout the country by means of conventions, jubilee celebrations, services of song, &c., to an extent unlike anything in England.

(3) *Continent of Europe.*—In almost all the Protestant countries of Europe S.-S. have been voluntarily introduced; in Germany in 1824 by Onken at first in connection with the Sailors' Service at Hamburg; in the Netherlands by Dr. Capadose in 1837; in Sweden by Palmquest in 1857; in Switzerland Sunday-school societies exist both in the French and German-speaking parts, having been greatly quickened about 1850 by the efforts of Mr. Woodruff, an American gentleman, who has done more for this cause on the Continent than any other individual labourer. In Roman Catholic countries S.-S. have been used extensively as a missionary agency, and in this form they have done much good in France, Italy, Spain, and parts of Austria. In Russia even beginnings have been made. Of S.-S. in the colonies and at mission stations among the heathen but little need be said; in both the system has been found admirably adapted for maintaining an interest in religion where it is apt to be lost, and for imparting the seeds of divine truth in the hearts of the ignorant.

II. *Organisation.*—In this country S.-S. are divided into Congregational and Mission S.-S., the latter being planted among the more neglected portions of the population, and very much corresponding to Ragged Schools (q. v.). As a rule both are in connection with some congregation, though latterly attempts have been made to establish them on a broader basis. In America the Sunday-school is not so much a distinct agency supported by a given congregation as one form in which for special purposes the entire congregation appears. Besides systematic instruction in the Bible, with which is often joined some Church Catechism, by a staff of teachers headed by a superintendent, from a very early period Sunday-school libraries were established, and have exercised an immense influence for good over the land, besides calling into existence quite a special form of literature; and to this has more recently been added special training in music, the effect of which also has been found most beneficial. For teachers the only provision made in this country is the publications of the various Sunday-school societies, Conventions on the American system, and occasional lectures on teaching; in America they can be trained at regular Institutes established for that purpose. For quickening the churches generally and encouraging isolated workers, the services of a paid travelling agent, now appointed for Scotland, have been found invaluable.

Information as to the history and working of S.-S. is nowhere accessible in a convenient form. Besides the reports of the various societies and church committees, see Watson's *First Fifty Years of the Sunday School* (Lond. N.D. about 1862); Pardee's *Sabbath School Index* (Nisbet, 1868); Tiesmeyer's *Die Praxis der Sonntagschule* (Barmen 1874); and Gregory's *Life of Robert Raikes* (1877).

Sundeep (*Sandwip*), an island at the mouth of the Meghna, the principal mouth of the Brahmaputra, included within the district of Noakolly, Bengal, British India. Area, 420 sq. miles; pop. (1872) 87,016. It is of recent alluvial formation, and liable to be swept by floods. By the disastrous cyclone of 31st October 1876 one-half the population is estimated to have perished either of drowning or subsequent cholera. The crops are rice and betel-nuts. In the 17th c. it was notorious as the home of Portuguese pirates, who devastated all the river coasts of Bengal; and up to a late period lawlessness has prevailed, owing to the difficulties of communication with the mainland.

Sun'derbunds, The (*Sûndarbans*), a wild tract of forest and swamp, which terminates the sea face of the delta through which the united streams of the Ganges and Brahmaputra find their way into the Bay of Bengal. The area is variously estimated at from 7532 to 5570 miles, according as the more settled portions are included or not. The former is the area under the commissioner of the S. The districts of the 24 Pergunnahs, Jessore, and Backergunge form the N. boundary. The population is very sparse; both rice-cultivators and woodcutters come only for the season. There are many Mughs, or immigrants from Burmah. The name is probably derived from the jungles of *sundri* trees, which are much used for boat-building. There are frequent signs of pre-existing settlements; and now, under the inducement of liberal land rules, cultivation is again extending. The firewood annually exported to Calcutta is estimated at 300,000 tons. Tigers are very numerous, as also rhinoceroses and other wild animals. The climate is very dangerous to Europeans; and partly from this cause the settlements at Morrell Gunge and Port Canning have proved failures. Through various natural and artificial channels of the S. is conveyed about half the enormous boat-traffic which Calcutta carries on with E. Bengal. In 1876-77, 130,000 boats were registered as passing Khulna.

Sun'derland, a seaport of England, county of Durham, on both banks and close to the mouth of the Wear, 13 miles N.E. of Durham and 274 N. of London by the North-Eastern Railway. The parliamentary borough includes the conterminous suburbs of Bishop-Wearmouth on the S., and Monk-Wearmouth and Southwick on the N. side of the Wear. The High Street is about a mile long, and separates Fawcett Street from Bridge Street, the latter of which crosses the Wear by an iron bridge of one arch, repaired and widened by Robert Stephenson (1858) at a cost of £40,000. Costing originally £33,400, this bridge, opened in 1796, has a span of 236 feet, and a height of 100 at low water. A new high-level bridge, erected by the N.-E. Railway Company, is 100 feet high and 300 long. The older, low-lying parts of S., though much improved since 1855, are still in a defective sanitary state, and an application was made to the Local Government Board for power to borrow £26,000 for the extension of the drainage system in December 1878. S. has several good public buildings, two theatres, a large infirmary (1867), a spacious workmen's-hall (1868), a subscription library with lecture theatre (1878), a central railway station (1879), three new banks, and a public library and museum (1879), while tramways were laid down in 1879. S. Park, which was enlarged from 12 to 24 acres in 1866, contains statues of Sir Henry Havelock (1861), and the late J. Candlish, M.P. (1875). One of the greatest coaling-ports in the world, S. has also important industries in iron shipbuilding and heavy iron-forging, and in making glass, cordage, earthenware, &c. A new cable-testing establishment is the largest in the world. There are also large marine engineering works, where engines of 65 tons are lifted on board vessels in a finished state. Shipbuilding yards and factories line both banks of the Wear for over 5 miles. The harbour, defended by three batteries, is formed by two piers, in length 590 and 650 yards respectively. The depth on the bar varies from 18 to 21 feet in ordinary tides, and there is a still deeper sea entrance to the docks, independent of the river. The sea-outlet formed by piers, 1600 and 1100 feet long respectively, affords a depth of 26 feet at ordinary high tides. Besides the extension of the South Dock, and the addition to it of graving and timber docks, the Hendon Dock of 11 acres was constructed (1868) with warehouses, staiths, hydraulic machinery, steam cranes, &c. It is the deepest dock along the N.E. coast—29 feet 6 inches. A 'lock,' designed by Mr. H. Wake, and connecting the Hendon Dock with the sea, is in course of construction (January 1879). The largest lock on the E. coast, it is 480 feet long, 90 broad, and 30 deep, admitting the passage of ships in all states of tide. The Hendon Dock has new spouts capable of discharging 400 tons an hour. In the dock and river are four sets of lofty steam shears which lift 70 tons. Altogether the Wear Commission has jurisdiction (1879) over 75 acres of dock and harbour and 225 of land, and 10 miles of river. An extensive area has been recently reclaimed by the construction of a new quay line. In 1877 there entered the port, including coasters, 9691 vessels of 2,333,490 tons (3366 steam of 1,453,613 tons), and cleared 9698 of 2,396,304 tons (3365 steam of 1,490,401 tons). In the same year there were 82 vessels built of 77,479 tons (48 steam of 44,192 tons). The total value of imports (cattle, &c.) was £888,992, and of exports of British produce £706,611; the export of coal alone amounted to 3,409,944 tons. Fishing is a thriving industry. About a mile from S. is the suburb of Roker, a popular watering-place. S. sends two members to Parliament, and publishes five newspapers. Pop. (1871) of municipal borough 98,242; of parliamentary, according to Registrar-General (1879) 114,575. Extant records show that there existed at Monk-Wearmouth in 674 a monastery, in which the Venerable Bede spent the greater part of his life. A charter was granted to S., already a place of commercial importance, by Hugh Pudsey, bishop of Durham, in the 12th c. The town was ravaged by cholera in 1832, and again in 1849.

Sun'derland, Henry Spencer, first Earl of, born in 1623, succeeded to the title of Baron Spencer (q. v.) of Wormleighton by his father's death (1636). On the outbreak of the Rebellion he joined the king, and having gained an earldom by gallantry at Edgehill and a loan to Charles of £15,000, fell in the battle of Newbury, 19th September 1643. By his countess, Dorothy, sister to Algernon Sydney and Waller's 'Sacharissa,' he was father of **Robert Spencer**, the second earl, born about 1641. Having served as ambassador to Spain and France, this nobleman was appointed secretary of state (1679), and attaching himself to the Duchess of Portsmouth, at first was all for excluding, then truckled to, the Duke of York. So well did S. play his cards that on James's accession he became prime favourite and President of the Council, whilst with Father Petre he formed the so-called 'secret council,' feigning conversion (1687). Apologists, Burnet amongst the number, hint that this change of faith was made 'to gain more credit, that so he might the more effectually ruin the king,' and his dismissal (1688) suggests that James himself had doubts of his fidelity. Anyhow, exempted from William's act of indemnity, he spent the two years succeeding the Revolution on the Continent, but, back in England in 1691, soon stood as high in favour with the ruling as ever with the banished king. To his secret advice was due the formation of the earliest ministry (1693), whereby a new machinery of government was fitted to the new order of political life; but he did not himself take office till two years later, when he succeeded Dorset as Lord Chamberlain. His tenure of this post was brief. Lord Norris in the Lower House fell upon him 'as one so scandalous that he could only excuse one crime by charging himself with another,' and in 1697 he withdrew to Althorpe, his splendid Northamptonshire seat, where he died, 28th September 1702. His son, **Charles Spencer**, third earl, born 1674, represented Tiverton as an ardent Whig from 1695 till his elevation to the Upper House in 1702. The Duke of Marlborough's son-in-law, he was one of the secretaries of state (1707-10), and after Marlborough's fall rose by his abilities to be recognised leader of the Whigs. Yet S. on George's coming to the throne found himself shelved with the lord-lieutenancy of Ireland and other minor posts till 1717, when, having achieved the downfall of Townshend's ministry, he was appointed First Lord of the Treasury. His Limited Peerage Bill (1719), meant to curtail the future regal power of the Prince of Wales, his bitter enemy, was thrown out on a second reading, and the bursting of the South-Sea Bubble (q. v.) in 1721 brought S.'s hopes of a great political career to a sudden check. He was indeed acquitted by his peers of having received a bribe of £50,000 from the directors, but the public indignation forced him from office, and after a year of vain intrigues against his great rival Walpole—Pope says with the Pretender—he suddenly died, 19th April 1722, leaving three sons, of whom Charles became Duke of Marlborough (1733). See the Histories of Ranke, Macaulay, Stanhope, and Lecky.

Sun'dew (*Drosera*), a genus of slender, glandular herbs comprising fully nine-tenths of the natural order *Droseraceæ*. They inhabit sandy, peaty, and marshy ground, and are most common in Australia. A deep red-purple dye can be extracted from some. Of the 100 species 3 are natives of Britain, occurring in moist heaths and bogs. *D. rotundifolia* (Round-leaved S.), which is the most common, is at the same time the most interesting, having been used by Dr. Darwin to establish the curious fact of the carnivorous appetite of certain plants. His experiments, those of his son, of Dr. Nitschke, and of others, have determined that this S. manures itself through its leaves, catches insects, and absorbs and assimilates the nitrogenous matter which they contain, and that under the stimulus of a supply of suitable food the cell-contents of the cells of the leaf-glands secrete a substance having very much the properties of pepsin, and an acid fluid closely resembling that produced in the stomach of the higher animals during the process of digestion.

Sun-Di'al. See DIAL.

Sun'fish (*Orthagoriscus*), a genus of Teleostean fishes belonging to the group *Plectognathi* (q. v.), and distinguished by the extreme shortening of the body. There is a single dorsal fin; the pectorals are placed behind the eye; the under margin of the body is bordered by a membranous fin, and there is a small anal fin. The *O. mola* or Short S. F. is often cast ashore on British coasts. The Oblong S. F. (*O. oblongus*) is a second species more rarely found in British seas, but attaining a length of 6 feet, and an immense weight. It is usually captured by a line and harpoon. The liver yields a large quantity of oil.

Sun'flower (*Helianthus*), a genus of coarse, tall, herbaceous plants, with large rough leaves and yellow flowers, belonging to *Compositæ*, and natives of America. *H. annuus*, an introduction from Peru, which has long been grown as a showy and large-flowered annual in gardens, has recently been found to possess high economic value. In Germany, Russia, India, and other countries it is now grown on a large scale. The seed-like nutlets in a natural state are excellent food for poultry and pigs; roasted, they are said to be a good substitute for coffee; crushed and pressed, they yield a limpid bland oil second in value only to olive-oil, either for household purposes or as a lubricator for the delicate machinery of textile fabrics, while the residuum can be used as an oil-cake to fatten cattle; the stalks furnish a good fibre; the blossoms yield a brilliant lasting yellow dye, and the leaves serve as manure. The tubers of the S. artichoke (*H. tuberosum*) are saccharine, and serve culinary purposes. As fodder they increase the milk of cows to an extraordinary degree. The foliage is also a good fodder. (See JERUSALEM ARTICHOKE.) The name S. is taken from the large flower 'resembling the radiant beams of the sun.'

Sunn, or Indian Hemp (*Crotalaria juncea*), a large leguminous annual, rising under favourable circumstances to a height of 10 feet, in appearance resembling somewhat the allied 'Spanish Broom' (q. v.). It is indigenous to S. Asia, and also widely distributed through tropical Australia. In the former country S. has been cultivated from remote times for its fibre, which is manufactured into rope, sackcloth, nets, twine, and paper. It is sown very thickly at the beginning of the rains, so that it may grow tall and slender. When flowering commences the plants are cut near the root, tied in large bundles, immersed in water from four to eight days, beaten on a piece of wood or stone, washed till quite clean, dried, and the broken woody portion separated from the fibre, which is then ready for use. S. is also grown as a fodder plant for cattle. The sub-species, *C. tenuifolia*, furnishes Jubbulpore hemp; *C. retusa* yields a fibre for ropes and canvas, and *C. Burhia* for ropes.

Sunn'ites See MOHAMMEDAN SECTS.

Sun'-Stroke (sometimes called *Heat-Apoplexy*, *Heat-Asphyxia*, *Insolatio*, and *Coup de Soleil*) is a very fatal affection of the nervous system, of frequent occurrence in tropical countries, more especially among Europeans, and in temperate climates during extremely hot summer seasons. There is probably a distinction between S. and heat-apoplexy, but the difference is not generally recognised. S. may be described as acute poisoning of the nerve-centres with superheated blood, the resulting phenomena being an acute paralysis of the nerve-centres, generally implicating principally the centres of respiration and of heart-movements. S. occurs from exposure to the direct rays of the sun in tropical climates, and more especially among those who have the head uncovered or imperfectly covered. Heat-apoplexy most frequently occurs through the fatiguing marches of troops during the heat of the day in a tropical climate; the over-exertion and exposure of tiger-hunters; the overcrowding which frequently occurs in barracks and ships; and the intense tropical heat during calm weather. In S. the affection is sudden, and there may be no premonitory symptoms; but in heat-apoplexy the accession of symptoms is gradual. Dr. Anstie states that two clinical forms are recognised by authorities—the cardiac and the cerebro-spinal. In the former, the course is rapid and the issue fatal, almost from the necessity of the case; in the latter, there is far more chance for life, and at any rate the end does not come so soon. In the cardiac variety, there may be no preliminaries whatever. In the cerebro-spinal variety, which is the commoner, there is usually a distinct train of preliminary symptoms. Very commonly there is mental derangement, usually of the nature of hallucination; the patient is more or less delirious; and occasionally he becomes dangerously furious and homicidal or suicidal. After a short time he becomes drowsy and lies down; he rolls about uneasily, and there is a constant desire for micturition; he then passes into a state of coma with stertorous breathing and gradually-increasing insensibility. In some cases there are convulsions, but in others the patient lies motionless and expires.

Treatment.—The patient should be removed instantly from the sun to as cool a place as possible, and the coldest water pro-

curable should be poured over the neck, shoulders, and chest, and ammonia should be placed to the nostrils. When the immediate danger from syncope is over, an endeavour should be made to reduce the temperature of the blood by the cold douche, or by enveloping the patient in a sheet dipped in water with lumps of ice in it. If available, he may be put into a bath of water at 90°, which may be gradually cooled down, in the course of twenty minutes or half an hour, by the addition of ice or cold water to about 62°. The bath must be so regulated as to keep the bodily temperature as low as 102°, but never to reduce it below 97°. Dr. Parkes recommends the injection of iced water into the rectum. The tincture of aconite may be given in doses of a single drop every five minutes at first; and afterwards at intervals of ten minutes, twenty minutes, and an hour. It is always of primary importance to relieve the bowels by active cathartics or enemata.

Suona'da, an inland sea of Japan, separating the islands of Kiusiu and Sikopf from Niphon, and communicating with the Sea of Japan by Van der Capellen Strait, and with the Pacific by Bungo Strait and Linschoten Strait. It is 250 miles in length and 50 miles at its greatest breadth. Having been closed contrary to treaty, the forts at its entrance were stormed by the British, French, and Dutch fleets, 5th and 6th September 1864.

Supercar'go, an official in a merchant ship having charge of the accounts, the disposal of the cargo, and in general all the commercial concerns of the voyage.

Su'pereroga'tion, Works of, is a doctrine that has its foundation in that of the communion of saints. A distinction appeared to exist between the precepts of Christ regarding all moral and religious duties which were of universal obligation, and the 'counsels of perfection' enjoined on those who could receive them—martyrdom, virginity, and voluntary poverty. These being voluntary works 'over and above God's commandments,' were called W. of S. Again it appeared from Col. i. 12, that a certain amount of suffering had to be endured by the Church, so that whatever was suffered by anyone, diminished by that amount what remained for others. Similarly, as the Church had fellowship with Christ in holiness as well as suffering, it followed on the same principle that the good works wrought by Christ in some, and which he had promised to reward, might avail to supply the deficiencies of others. Hence the belief arose that W. of S. done by saints availed to diminish the temporary consequences of sin in others, and led to the system of Indulgences (q. v.), which gave rise to great abuses.

Su'perfœta'tion is the term used to designate two distinct conceptions, occurring in the same woman, at an interval of greater or less duration. A second conception may, at any time, follow the first, and gestation may go on to its full period, in each instance, independently of the other: so that if a woman were impregnated when in the third month of gestation, she would bear the first child mature at nine months, and the second child, also mature, at the end of twelve months after the first conception. The possibility of S. has been vigorously opposed by Wagner, who termed it a physiological impossibility; and by most of the modern English writers, including Drs. Ramsbotham and Churchill. In a paper by Dr. Bonnar, of Cupar-Fife, published in the *Edinburgh Medical Journal*, January 1865, a number of cases are given, in which children, born in wedlock, succeeded each other with very unusual rapidity. Dr. Duncan believes, from anatomical investigations, that up to the third month of gestation a second conception may follow the first, and he is of opinion that this will satisfactorily account for all the cases of S. on record.

Supe'rior, in Scotch law, is one who, or whose predecessor, has made a grant of heritable (real) property, under condition that the grantee shall annually or periodically pay him a certain sum, or perform a certain service. See DOMINIUM, FEU.

Superiority is, in Scotland, the right of the superior. It belongs to the Crown as overlord of all Scotland; or to a subject superior, as an intermediate overlord of land held by a vassal.

Supe'rior, Lake, the largest freshwater lake, and, with the exception of the Caspian Sea, the largest of all lakes in the world, lies between the United States and the Dominion of Canada, being bounded on the N. and N.W. by the province of Ontario and the State of Minnesota, and on the S. by the States of Wisconsin and Michigan. It is of triangular form, with an extreme length of 355 miles, an extreme breadth of 160, and a mean depth of 1000 feet. It is 627 feet above the sea-level, and 49 feet above Lake Huron, with which it is connected by the St. Mary River. Its area is upwards of 31,400 sq. miles, or about that of Ireland. The northern shores are high and rugged, while the southern are more sandy and flat, though at some points there are cliffs, such as the Pictured Rocks, which are celebrated for their bright colours and fantastic forms. From the S. shore the great Kewenaw Promontory projects into the lake nearly 75 miles. The geological formation around the lake is principally Laurentian and Huronian, with some Lower Silurian on the S. shore. The N. shore and Silver Island are rich in silver deposits, and the S. shore in native copper, native silver, and red hematite iron. There are only a few villages on the Canadian side, but on the United States side there are several busy mining towns, such as Fond du Lac (q. v.) in the W., and Marquette in the E. Navigation between Lake Huron and Lake S. is prevented by the rapids of the Gault Ste Marie, but this difficulty has been overcome by the construction of a canal on the American shore, about a mile in length, and with two locks. Isle Royale, 44 miles long, the largest island in the lake, belongs to the United States, and only a few of the smaller islands along the N. shore are Canadian. The fisheries of Lake S. are considerable, white fish and grey trout being abundant. The water of the lake is very clear and cold, and as it is fresh and so easily moved, the waves run very high during storms, which are frequent. The lake is never frozen over, but the shore ice puts a stop to navigation during the winter.

Sup'ple Jack, a name given to various strong twining and climbing shrubs of the Western hemisphere. The S. J. imported into Europe from the W. Indies for walking-sticks is the barked branches of one or more species of *Paullinia* of the natural order *Sapindaceæ*. From the tough and flexible quality of these branches they are commonly employed as riding-switches in Jamaica. In the United States, S. J. is applied to *Berchemia volubilis*, a rhamnaceous twiner which ascends the highest cypresses (*Taxodium distichum*) in the Dismal Swamp.

Supply', Commis'sioners of, are officers employed in Scotland under the Valuation of Lands Act to assess the Land Tax (q. v.). They make up an annual valuation roll, showing necessary particulars.

Supply', Committ'ee of. See PARLIAMENT.

Support'ers, in Heraldry, are figures placed in the attitude of holding up or protecting a shield, almost always in pairs, one being on the dexter the other on the sinister. They are believed to have been introduced in the time of Edward III. S. belong by right to all peers of the realm, Knights of the Garter, Knights Grand Crosses of the Bath, Nova Scotia baronets, and chiefs of Scottish clans, and are conceded to sons of peers bearing honorary titles of nobility. In England they are granted solely by the sovereign; in Scotland by the Lord Lyon. Of the lion and unicorn that appear as S. in the royal arms of the United Kingdom, the former is from the achievement of England, the latter from that of Scotland prior to the union of the crowns.

Suppura'tion is a morbid process which gives rise to the formation of pus, one of the destructive terminations of the inflammatory action. The phenomena of S. are thus described by Mr. Holmes:—'The inflammatory leucocytes, instead of developing into fibre cells and forming tissue, become developed into pus globules, and the exudation breaks down more or less completely into a creamy fluid called pus, which consists of these globules floating in serum, the liquor puris. Pus globules, as seen out of the body, are but little different in appearance from leucocytes. The leucocyte, when treated with acetic acid, displays the appearance of a nucleus in its interior, that appearance being usually regarded as the result of a shrinking of the protoplasm of which it is composed. The pus globule shows more distinct trace of a membrane, and is frequently many-nucleated when treated with acid, a condition which Rindfleisch regards as indicating a tendency to degenerate and break down. But the same author says that many of the corpuscles of pus display no difference whatever in character from the blood leucocytes, having only single nuclei, showing the same amœboid movements, and being in fact obviously the same things both in structure and function. This should be borne in mind in connection with the fact that S. is not, in most cases, wholly a destructive process,

but serves also as one of the usual modes of repair.' The result of the process of S. is thus twofold, being in part destructive, and in part constructive. S. in the interior of the body usually terminates in the formation of an Abscess (q. v.); but in some cases the matter is diffused through the interstices of the part, and is termed diffuse Inflammation (q. v.).

Su'pralapsa'rian. See SUBLAPSARIAN.

Supra-Re'nal Cap'sules, two bodies of small size, situated one above each kidney, and attaining about 1½ inches in diameter, and a weight of from 1 to 2 drachms. The left supra-renal body is almond-shaped; the right resembles a cocked hat. Each is covered by a thin membrane, and consists of a firm outer portion, and a soft medullary or central substance, composed of clusters of *columns*, each about $\frac{1}{750}$th of an inch in diameter. They are well supplied with blood-vessels and nerves. The prevalent idea regarding the functions of the S.-R. C. is that they must be ranked with the *ductless glands*, of which the *thyroid*, *thymus*, and *spleen* are examples. If this view be correct, the S.-R. C. may be regarded as adjuncts to the circulatory and absorptive systems. They have attracted attention on account of a relationship which Dr. Addison of Guy's Hospital supposed to exist between them and a bronzed appearance of the skin which has received the name of 'Addison's disease' (q. v.).

Suprem'acy, Royal, as a term in English law, is practically restricted to questions affecting the ultimate appeal in matters ecclesiastical. In the early times of the English monarchy the supreme authority here as elsewhere was undoubtedly vested in the crown, but from the time of Stephen onwards appeals to Rome (though by the statute 16 Rich. II. c. 5 entirely illegal) became gradually more frequent, and had to be expressly forbidden by the Act of Appeals (24 Henry VIII. c. 19); the supremacy of the crown in matters spiritual and ecclesiastical being expressly asserted later in the Act of Supremacy (1 Eliz. c. 1). Even in Elizabeth's reign this jurisdiction was vested in the Court of High Commission, whose flagrant abuse of power during the reign of Charles I. led to its suppression in 1640, and from the Restoration to 1832 a special commission was appointed under the Great Seal to decide each case, the members being chosen from a permanent list, which consequently acquired the title of High Court of Delegates. In 1833 it was enacted (3 and 4 Wm. IV., c. 41) that all appeals should be referred to a judicial Committee of the Privy Council, who should report thereon to the sovereign. The most familiar form in which the R. S. appears, is in the nomination to bishoprics and archbishoprics (see BISHOP). By 14 and 15 Vict., c. 60, the Act of Papal Aggression was declared to be an infringement of the R. S., but this statute has been allowed to fall into abeyance. See Blackstone; also Brodick and Freemantle, *Ecclesiastical Judgments of the Privy Council.*

Surabay'a, a seaport on the N.E. coast of Java, and the best harbour in the island, at the mouth of a branch (the Kali Mâs) of the Kedirie River, near the Strait of Madura. The European town, which is on the W. bank, communicates with the Chinese and Javanese quarters opposite by five bridges. S. is the headquarters of the Dutch military, and exports rice, coffee, sugar, cotton, indigo, tobacco, &c. It is connected by steam lines with Sumatra, Batavia, &c., and by a railway (68 miles; opened 16th May 1878) with Passaroean and the Malang coffee district. Pop. 89,000. The Residency of S., which is well cultivated, and includes the island of Madura, has a pop. of 1,218,827, including 4217 Europeans and 7436 Chinese.

Surat', the chief town of the district of the same name, in the Bombay Presidency, British India, and formerly the commercial capital of the W. coast, lies on the left bank of the river Taptee, 15 miles from its mouth, 167 miles by rail N. of Bombay, and 130 S. of Ahmedabad; pop. (1872) 107,149. The town is first heard of in 1512 as sacked by the Portuguese. The first English factory was established here in 1612, and forty years later all the other possessions of the Company were placed in subordination to it. In 1692 the seat of government was transferred to Bombay. Henceforth S. became a bone of contention between the Mogul deputy and Mahratta invaders. In 1759 the English seized the castle; and in 1799, on the death of the last real Nawaub, themselves assumed the administration. In 1842, the titular dignity of Nawaub of S. also became extinct. S. is still a considerable centre both of trade and minor manufactures. The exports are cotton and grain; but the opening of three several railways to Bombay, and the superiority of the harbour at the latter place, has caused S. to be superseded in commercial, as formerly in political, importance. The town is still surrounded by a wall, and the fort or castle yet remains. The streets are narrow, and the upper storeys of the houses overhang with frameworks of wood. Sea-going vessels cannot cross the bar of the Taptee. The river, here 1700 feet wide, is crossed by an iron-girder bridge, recently completed at a cost of £70,000. The English Church dates from 1820, but there are many old European tombs of the 17th c. There are four principal mosques, many Hindu places of worship, two Parsee fire-temples, and a hospital built at the cost of Sir Kawasji Jahangir for £7000. The official buildings are all either within the castle or on the 'Dutch wharf.' The municipal revenue in 1875 was £20,000.—The *district* of S., which lies between Baroda and the Arabian Sea, has an area of 1588 sq. miles; pop. (1872) 607,087. The chief crops are millets of several kinds, rice, pulses, oil-seeds, and cotton. In 1875, 60,000 acres were under cotton. In the same year the total exports by sea and rail were valued at £1,013,000, chiefly cotton (£292,000) and grain (£169,000); the imports were valued at £640,000, principally piece-goods, cotton-twist, and metals. See *Gazetteer of Bombay*, vol. ii. (Bomb. 1877).

Suraj'ah Dow'lah (*Sirâj-ud-Daulah*), the last of the independent Nawaubs of Bengal, and the instigator of the massacre of the Black Hole. In 1756 he succeeded his grandfather, Ali Verdy Khan, a man of great ability, to whom he had behaved as a second Absalom. S. D. began his reign by plundering his wealthy relations, and within two months after his accession marched against Calcutta on some slight pretext. His object was money; and the death of 123 English prisoners in the military dungeon of Fort William was, from his point of view, an unimportant accident. The arrival of Clive and Admiral Watson caused his retreat to Moorshedabad. Peace was at first concluded, but a conspiracy among the Nawaub's officers led to the battle of Plassey. After his defeat, S. D. fled up the Ganges, but he was betrayed by a *fakir* whom he had previously wronged, brought back, and killed by order of the son of Meer Jaffier, the new Nawaub installed by the British. He had not completed his twentieth year, and was only fifteen months on the throne.

Surakar'ta (*Solo*), a trading town on the N.E. coast of Java, near the mouth of the river Solo, opposite the island of Madura, and 150 miles W.S.W. of Samarang by rail (opened in 1870). It is the chief town of the feudatory state of S., and the residence of the emperor and of many of the native princes and nobles. The emperor's palace is a building of great extent and grandeur. The European town, defended by a strong fort, has a trade in rice, sugar, coffee, pepper, tobacco, &c., and a pop. of 110,000. —The Residency of S., with an area of 2366 sq. miles and a pop. of 717,000, is well cultivated and yields abundance of Javanese products.

Surd, in algebra, is synonymous with the term *irrational quantity*. See IRRATIONAL.

Sure'ty. See GUARANTEE.

Sur'face, in mathematics, is the boundary of a solid, and has two dimensions, length and breadth. It may be conceived to be generated by the motion of a straight or curved line, just as a curve is generated by the motion of a point. Of all surfaces, the most important are those of the second order, which are intersected by a straight line in at most two points, and whose curve of section by a plane is a curve of the second order. Hyperboloids, ellipsoids, paraboloids, spheres, cones, and cylinders, and also the limiting case of two planes, are included among the so-called quadric surfaces. See Salmon's *Analytical Geometry of Three Dimensions* (1865, 3d ed. 1874).

Sur'face Grub, a name applied to the larva or caterpillar of the Great Yellow Underwing Moth (*Tryphæna pronuba*), attaining a length of an inch and a half, and of a pale-green colour tinted with brown and spotted with black. The larva is destructive to vegetables. It appears commonly in hayfields in spring and summer. The moth itself is of a pale tawny colour on the upper wings, and has the hind wings of an orange hue.

Surf Duck. See SCOTER.

Sur'geon, Military and Naval. See MEDICAL DEPARTMENT OF THE ARMY AND NAVY.

Sur'geons, College of. The Royal C. of S. of England was founded in 1460-61, in the reign of Edward IV., who 'did, at the supplication of the freemen of the mystery of barbers of the city of London using the mystery or faculty of surgery, grant to them that the said mystery, and all the men of the same mystery of the said city, should be one body and perpetual community.' In 1500, four Masters in Surgery were appointed under the designation of 'Magistri sive Gubernatores mistera barbitonsorum et sirurgicorum.' In order to check unqualified practitioners, it was enacted in the third year of Henry VIII. (1511) 'that no person within the city of London, or within seven miles of the same, shall take upon him to exercise or occupy as a physician or surgeon except he be first examined by the Bishop of London, or by the Dean of St. Paul's, calling to him four doctors of physic, and for surgery other expert persons in that faculty.' In the thirty-second year of Henry VIII. (1540), the Company of Barbers of London and the Company of Surgeons of London were united by the name of 'The Masters, Governors, and Commonality of the Art and Science of Surgery of London.' This extraordinary and incongruous union continued for nearly 200 years after; for it was not till the fifteenth year of George II. (1745) that the surgeons of London were made a distinct corporation under the name of 'The Masters, Governors, and Commonality of the Art and Science of Surgery of London.' This company was dissolved in the fortieth year of George III., and replaced by 'The Royal College of Surgeons of London.' In the seventh year of Victoria (1843) a new charter was granted to the college, in which it is declared 'that it is expedient to create a new class of members to be called *Fellows*,' and 'that from henceforth the corporate name or style of the said College shall be The Royal College of Surgeons of England.' Power was given to the Council to elect not less than 250, nor more than 300, members of the college to be fellows. By an addition to the charter, obtained in 1852, power was given to the council, subject to certain regulations, to appoint members of fifteen years' standing to the fellowship without examination; but those who are admitted to the fellowship by examination are distinguished in the college list by having the letters *Ex.* affixed to their name. The college was likewise empowered to grant certificates of fitness to practise midwifery; and, in 1859, to grant similar certificates to dentists.

The government of the college is vested in a council of twenty-four persons, including a president and two vice-presidents, and all the members of the council must be fellows of not less than fourteen years' standing. There is a Court of Examiners; examiners in medicine; a board of examiners in midwifery, and in dental surgery; professors of surgery and pathology, comparative anatomy and physiology, and dermatology; and a lecturer in anatomy and physiology. The other officials are, conservator of museum, librarian, secretary, and clerk. Three members of council go out annually by rotation, and the vacancies are filled up on the first Thursday of July. The examiners are elected by the council, and the professorships are in the gift of the college. A Hunterian orator is appointed every second year, and the college sends a representative to the General Council of Education and Registration.

There is a museum attached to the college, the most complete in the United Kingdom, the basis of which was the celebrated Hunterian collection, purchased by a Parliamentary vote of £15,000, and presented to the college in 1799. In 1813 the museum was opened, the building having been erected partly from public funds and partly from the college fund, £12,500 having been contributed by Government, and £21,000 by the college. Since that time the building has been repeatedly enlarged. There is a library in connection with the college, and both museum and library are accessible to visitors.

The regulations respecting the education and examination of candidates for the diploma of member may be found in the *Calendar of the Royal College of Surgeons of England.* The Royal College of Surgeons, Edinburgh, received its charter in 1505, and the Faculty of Physicians and Surgeons, Glasgow, was chartered in 1599.

Sur'gery, History of. See MEDICINE AND SURGERY, HISTORY OF.

Suri, the chief town of the district of Beerbhum, Bengal, British India, 109 miles N.W. of Calcutta, and 3 miles S. of the More river; pop. (1872) 9001. It is healthily situated on a gravel ridge, but has no trade or manufacture.

Sur'inam. See GUIANA.

Surmull'et (*Mullus*), the name given to various Teleostean fishes of the family *Mullidæ*, the name 'Mullet' (q. v.) being generally used to designate the members of the family *Mugilidæ*. The surmullets or *Mullidæ* are represented by the *Mullus surmuletus*, by the plain red mullet (*Mullus barbatus*), and by the three-banded mullet (*Upeneus trifasciatus*) of tropical seas, &c. The S. attains a length of 18 inches and a weight of 2 lbs. The mouth is provided with two long barbules. It is sometimes captured in shoals in trawl nets, but at other times is very scarce. The colour is a pale pink, and a general mixture of purple and red prevails, the body being banded with longitudinal stripes. The Romans considered it one of the finest of fish, and it is still in high repute.

Sur'name. See NAME.

Sur'plice (Fr. *surplis*, Low Lat. *superpellicium*, from Lat. *super*, 'above,' and *pellicium*, 'a pelisse') is the name given in the Anglican Church to the vestment which was known in the early Church as the Alb or Albe (q. v.).

Sur'plice Fees are ecclesiastical dues payable to the clergy on marriages, churchings, christenings, and burials.

Surr'ey (Old Eng. *sud-rice*, 'the south kingdom,' *i.e.*, of the 'Saxons'), a county of England, separated in the N. from Middlesex by the Thames, and bounded E. by Kent, S. by Sussex, and W. by Berks and Hampshire. Area 483,178 acres; pop. (1871) 1,091,635. One of the most picturesque of the inland counties, S. is traversed from E. to W. by the ridge of the N. Downs (q. v.), from which the surface slopes gently towards the Thames, the valley of which is in great part well wooded, and in part occupied by extensive market-gardens. The southern part lies within the Weald (q. v.), and the highest point in the county is Leith Hill (993 feet), 4 miles S.W. of Dorking. The central range is formed mainly of chalk and green sandstone, and the northern slope of London and plastic clays, overlaid by rich alluvium along the river banks. There extend from the centre to the W. border the bleak downs of Bisley, Bagshot, Cobham, Epsom, Wimbledon, and Working. Almost all the streams are tributary to the Thames, and of these the principal are the Mole, Wey, and Wandle. On Box Hill grow the finest of English box-trees. S. in 1876 had 97,679 acres in corn crops, 45,882 in green crops, 31,041 in sainfoin, clover, and grasses in rotation, and 109,862 in permanent pasture, exclusive of heaths; while the number of sheep was 89,576, of cattle 42,425, of horses 13,811, and of pigs 31,331. In the same year the crops comprised 39,912 acres of wheat, 18,630 of barley, 27,807 of oats, 3430 of beans, 6529 of pease, 4056 of potatoes, 20,317 of turnips, 9049 of mangold, 2737 of cabbage and rape, 8957 of vetches, lucerne, &c., 167 of flax, and 2194 of hops. S. includes the portion of London S. of the Thames forming the parliamentary boroughs of Lambeth and Southwark. Guildford (q. v.) is the chief town. Besides the varied industries around London, there are many corn, paper, snuff, and oil mills on the Mole and Wandle. Other towns of S. besides those mentioned are Godalming, Farnham, Epsom, Chertsey, Staines, Richmond, Kingston-on-Thames. The county returns four members to Parliament. See Jennings' *S. and Sussex* (Lond. 1877).

Surr'ey, Henry Howard, Earl of, an English poet, grandson of the victor at Flodden, was born about 1517. Of his earliest years nothing is known, but in 1526 he was cup-bearer to Henry VIII., whom he attended on his famous visit to Boulogne in 1532, when the interview took place between the English and French monarchs on the 'Field of the Cloth of Gold.' In 1533 he was present at the coronation of Anne Boleyn, and carried the 'fourth sword with the scabbard upright before the king.' There is no evidence that he was entered either at Cambridge or Oxford, but his poems show an exquisite renaissance culture, which he probably owed to the liberal associations of home. 'His father is said to have been a patron of men of letters; his mother was the friend and protector of Skelton, who celebrates her bounty in the *Crown of Laurel;* and amongst the close circle in whose society his boyhood was passed were such men as Lord Berners, the translator of Froissart, Vere, Earl of Oxford, Lord Stafford, Lord Morley, and others equally distinguished by their literary attainment.' In 1536 S. lost his dear friend and brother-in-law, the Duke of Richmond. To this period belongs the romantic but unhistorical episode in

his career—his visit to Italy in the character of knight-errant to assert the peerless charms of his mistress Geraldine—a story which first appeared in Nash's *Unfortunate Traveller, or Life of Jack Wilton* (1594), and was first exploded by Dr. Nott in his elaborate edition of Wyatt and S. (1815). In 1535 S. was in fact married to the Lady Frances Vere, and his eldest son, Thomas, was born in the following year at the very time the poet is represented as tilting in the lists at Florence in honour of a paramour who was only seven years of age! In 1537 S. was a chief mourner at the funeral of Lady Jane Seymour; in 1540 he took part in the tourneys held at the marriage of Anne of Cleves, and in September 1541 he was appointed along with his father joint-steward of the university of Cambridge. In the wars with France (1544-46) S. was a commander and achieved some brilliant successes, but a disaster that happened to his troops at St. Etienne in January 1545-46 was made the occasion of his recall; the fierce hostility of the Hertford family (then highest in royal favour), encouraged by groundless rumours of S.'s 'designs upon the throne,' resulted in a charge of treason. The soldier-poet was condemned to death 13th January 1547, and on the 21st of the same month was beheaded at Tower Hill in the thirtieth year of his age.

S. will always hold a conspicuous place among English poets. Though not a man of original genius or even great power, he was fortunate enough to introduce a new style of poetry and a new form of verse, both of which have since been associated with some of the noblest achievements in our literature. He is the earliest of that 'subjective school' of which Wordsworth is the greatest. His master was Petrarch, who furnished S. not only with his sentiments but also with the mould in which they were cast. The 'lady' of S.'s sonnets may not have been so real as the 'Laura' of Petrarch's, yet sometimes it seems as if his pulses were stirred by a genuine emotion. S.'s translation of the 2d and 4th books of Virgil's *Æneid* is the first example of blank verse in the English language—unless we consider the earlier effort of Gavin Douglas in the dialect of the Scottish Lowlands entitled to that honour. None of S.'s poems were printed in his lifetime. They were first published along with Wyatt's in Tottel's *Miscellany* in June 1557. Numerous editions appeared during the 16th c., after which S. dropped into oblivion for nearly two centuries. The standard edition of S. is Dr. Nott's (2 vols. 1815); the 'Aldine edition' of 1831 is excellent; and that in Bell's *English Poets* contains a good memoir.

Sur'tees, Robert, born at Durham, April 1, 1779, graduated B.A. of Oxford (1800), and studied law at the Middle Temple till by his father's death in 1802 he came into the Mainsforth property. Thenceforth he devoted himself to writing his *History and Antiquities of the County Palatine of Durham* (3 vols. 1816-23), to the fourth volume (1840) of which, completed by the Rev. J. Baine, a Memoir by G. Taylor is prefixed. Hill Burton records some excellent *bon-mots* of his in the *Bookhunter*, and mentions that he contributed to Scott's *Minstrelsy of the Scottish Border* two 'ancient' ballads of his own composing—*The Death of Featherstonhaugh* and *Barthram's Dirge*. S. died February 11, 1834, and in the same year was founded the S. Society for editing unpublished MSS. chiefly relating to the Northern Counties.

Survey'ing is the art of determining the boundaries and area of a portion of the earth's surface. When the area is small the problem is one of simple trigonometry, and in all cases proceeds upon the method of triangulation. The bounded portion is divided up into triangles as far as possible, and from the direct measurement of the necessary elements the area is calculated. Practically this area may be found in terms of the lengths of the three sides, which are then directly measured by means of the chain; or, more simply, it may be expressed as half the product of the base and height. The one extremity of the height is of course the vertex, and the other extremity is easily obtained by means of the cross-staff, an upright staff with two cross sticks fixed above at right angles to the staff and to each other. By setting the cross-staff so that the one cross stick coincides with the base line and the other points towards the vertex, the extremity of the perpendicular from the vertex upon the base is obtained; and this perpendicular is the height of the triangle, and may then be measured directly by means of the chain. When the boundary is irregular, the area of the residual portions which necessarily lie beyond the limits of the triangulation are estimated by the method of taking Offsets (q. v.). In land S. on a large scale, a theodolite is used for the measurement of angles. A base line is first chosen and carefully measured; and from each extremity, which is marked by some object visible from a considerable distance, the angle between the other extremity and an arbitrarily chosen and convenient point is measured. This may be done directly; or, as is more usual, the geographical *bearings* of the new point with respect to the other points are measured, the orientation of the base-line itself being already known. Thus the base and contiguous angles of the triangle are given; and from these the other sides and area can be easily calculated. Each of these sides is now taken as a new base line, and new triangles constructed upon them by arbitrarily choosing new vertices; and thus, by the simple observation of the necessary angles, and the careful measurement of one base line, a large tract of country is triangulated and surveyed. To test the accuracy of the observations and to fix the limits of error, the last side, whose calculated value depends upon *all* the observations leading up to it, is measured directly as the original base-line was. When the triangulation extends over a whole country, correction must be applied to the value calculated because of the sphericity of the earth. The triangles are not plain but spherical; and the problem is therefore really one of spherical trigonometry. Such a consideration is, however, of small moment in military S., which usually refers simply to the construction of forts or earthworks. This particular branch of S. is in the hands of the Royal Engineers (see ENGINEERS, ROYAL). The great surveys are noticed under ORDNANCE SURVEY.

Su'sa (Gr. *Sousa*, Chal. *Shushan*, mod. Pers. *Sûs*; on the Persian cuneiform inscriptions *Su-s a-an* 'lily'), one of the capitals of ancient Persia, was situated on the Choaspes, and has now been identified with the extensive ruins on the left bank of the Kerkha, about 250 miles S.E. of Bagdad. It had a circumference of 120 stadia, and like Bablylon was built of burnt bricks cemented with asphalt. It was without walls, but its citadel, containing the treasury and mausoleum of the Persian kings, was strongly fortified. The founder of Susa is not known with certainty, but it was at least much enlarged by Darius Hystaspes, the ruins of whose palace, repaired by Artaxerxes Longimanus, have been excavated by Loftus and Williams. From the time of Cambyses S. was a favourite residence of the Persian kings. After Alexander and his successors had fixed their court at Babylon, S. declined in importance, though when besieged by Antigonus in B.C. 315 it was still one of the chief cities of Persia, and even as late as the middle of the 7th c. A.D. it offered under Hormuzan an obstinate resistance to the Saracens; but by the 13th c. it had become a heap of ruins. The most important of these ruins are those of the palace of Darius, the colonnade of which has a frontage of 343 feet, and a depth of 244. In general construction it exactly resembles the Hall of Xerxes at Persepolis (q. v.). References to S. abound in the ancient authors, especially Herodotus, Xenophon, and Arrian. See Rawlinson's *Five Monarchies* (1862-67).

Su'sa (anc. *Segusio*), a small town of Northern Italy, 44 miles W. of Turin by rail, lies at the Italian end of the now almost disused Mont Cenis road, constructed by Fabroni 1802-5. The cathedral church of S. Giusto dates from the 11th c., and has a baptistery of a single block of green marble. Pop. (1871) 3546. A triumphal arch erected in honour of Augustus by the Celtic chief Cottius still remains.

Susann'ah, the History of, or **The Judg'ment of Dan'iel**, is the title of one of the three Apocryphal additions to the Book of Daniel which are found in the Septuagint (q. v.). (See APOCRYPHA.) The design of the story is to celebrate the triumph of female chastity over temptations and dangers, and exalt the wisdom of Daniel, by whose acuteness the innocence of S. was established. It is not unlikely that the Alexandrian translator of Daniel wrought up a tradition already current, and which may have been founded on fact, but it is evident that the form of the story was due to its moral purpose. Early Christian theologians imagined it to be an allegory. S. was the Church, and the two elders were the Jews and the heathens.

Suspen'sion, in music, the repetition of a note in a given chord, having the effect of delaying or suspending for a moment certain notes in the second chord. The ninth is used to suspend

the octave in a common chord, or chord of the sixth; the fourth to suspend the third; and the seventh to suspend the sixth. Chords of S. can only be used on the accented parts of the bar. The note which forms the S. can never be doubled, nor can the note which it suspends appear in any of the upper parts.


Suspensions.

Suspen'sion and In'terdict (in Scotch law). See INTERDICT.

Suspen'sion Bridge, a type of Bridge (q. v.) in which a level platform or roadway is hung by means of suspension-rods from parallel chains, which are pendent from piers, and have their extremities anchored in the ground. Suspension-bridges constructed of flexible supports of different kinds, with a planking laid across them, have been in use in China, Japan, and Thibet from a remote period, and Humboldt also found them in S. America. This primitive plan, however, does not afford a level roadway, but in modern bridges on the suspension principle a perfect level is obtained by suspending the platform from the chains by vertical rods, which gradually shorten towards the centre of the span. The *chains* consist of links of iron pinned together, or more frequently of cables, composed sometimes of as many as 4000 steel wires, each about 0·16 of an inch in diameter, so twisted that each wire bears a portion of the strain on the cable. The *piers* or towers over which the chains pass are constructed of masonry, cast iron, or timber, and the *anchorages* consist of solid underground masonry, through which the extremities of the chains are carried, and secured to an *anchor-plate* beneath. The S. B. is well adapted for large spans, and it presents the advantage of great economy of constructive material over the girder-bridge, a much less mass of material being required to bear a given load. The main disadvantage of the S. B. is its flexibility, passing loads sensibly distorting the structure, and swaying being caused by high winds. Oscillation is somewhat counteracted by means of 'stays' joining different parts of the roadway to the piers and rocks on either side. Sloping instead of vertical suspension-rods also give increased rigidity. A true S. B. is unsuited for the passage of railway trains at high speed, but by combining the girder with the suspension principle the necessary stiffness is effected. Bridges of this description have been constructed in Great Britain and the United States, and in a railway bridge now (1879) in process of erection across the Forth in Scotland, two lattice-girder spans, each upwards of 1600 feet, are to be suspended by chains from piers 600 feet high. In 1741 the river Tees was spanned by a small S. B.; this was the first one in England. Jacob's Creek S. B., Pennsylvania, U.S., constructed in 1796, was the first in N. America, and it was followed within fifteen years by eight others. The Menai Strait (q. v.) S. B., long a world-wide wonder, has been outstripped in span by many structures, both in this kingdom and in the United States, notably by the Clifton S. B., across the Avon near Bristol, span 702 feet, height 248 feet; the railway bridge across the Niagara River, span 821 feet, height 245 feet; Clifton S. B., over Niagara Falls, span 1250 feet, height 190 feet; and Cincinnati S. B., Ohio, U.S., main span 1057 feet, height 100 feet. The East River S. B., connecting New York and Brooklyn, now (1879) in progress, is to have three spans, the centre one being 1600 feet.

Suspen'sion of Arms, a short truce in war, such as is granted for the burying of the dead or humane purposes, or for entering into negotiations regarding proposals for surrender, terms of peace, &c.

Susquehann'a, a river of the United States, of which the E. branch rises in Otsego Lake, State of New York, at an elevation of 1300 feet, while the W. and smaller branch rises in Cambria County, Pennsylvania. The E. branch, which is 250 miles long, flows through the famous and beautiful Wyoming Valley, and being joined by the W. branch (200 miles long) at Northumberland, Pennsylvania, it forms the main S. which flows into Chesapeake Bay at Port Deposit, Maryland, after a course of 150 miles. The S. is not navigable to any extent. A railway bridge 4000 feet long is to be constructed (1879) across the S. at New Cumberland, near Harrisburg.

Suss'ex (*Suth-Seaxna-Rice*, 'the kingdom of the South Saxons'), a maritime county of the S. of England, bounded on the E. by Kent, on the N. by Kent and Surrey, on the W. by Hampshire, and on the S. by the English Channel. Its extreme length is 73 miles, and its extreme breadth 27 miles. Area, 934,006 acres; pop. (1871) 417,456. The North Downs runs E. and W. through the whole county, and the South Downs, on whose fine pastures the famous South Down sheep are reared, along the sea-coast from the borders of Hampshire to Beachy Head, enclosing between them the rich valley known as the Weald. (See DOWNS.) In 1876 there were 209,026 acres under corn crops, 78,371 acres under green crops, 69,807 acres under clover and grasses in rotation, 11,175 of hop-gardens, 267,000 acres under permanent grasses, and (1872) 101,331 acres in wood, including the forests of St. Leonards and Ashdown in the north. In the same year there were in the county 26,259 horses, 97,820 cattle, 547,534 sheep, and 40,083 pigs. The principal rivers are the Arun, the Adur, the Ouse, and the Cuckmere, all flowing into the Channel. The seaports, Rye, Winchelsea, Pevensey, Seaford, Newhaven, Worthing, &c., are small and comparatively unimportant, but the mildness of the climate along the coast has led to the growth of many large and fashionable watering-places, such as Hastings, St. Leonards, Eastbourne, Brighton, Littlehampton, and Bagnor. The county is divided into the parliamentary districts of East and West S., each returning two members, the former consisting of the 'rapes' of Hastings, Lewes, and Pevensey, and the latter of the 'rapes' of Arundel, Bramber, and Chichester. The principal railway of S. is the London, Brighton, and South Coast line, with its branches, but the South-Eastern has also a branch in the county. There are many beautiful country residences in S., the most notable being Arundel Castle, the seat of the Duke of Norfolk, and Goodwood, the seat of the Duke of Richmond. See Lower's *History of S.* (2 vols. Lond. 1871), and G. F. Chambers' *Handbook to S.* (Lond. 1877).

Sustenta'tion Fund is a fund raised by the Free Church of Scotland for the support of its ministers. The first year after the Disruption (1843-44) it amounted to £68,704; for the year ending March 1878 to £177,387. All ministers of fully sanctioned charges receive an equal dividend. Besides which, those ministers whose congregations contribute at the rate of an average of 7s. 6d. per member receive a share of a surplus fund, the proportion received being larger if the contribution amount to 10s. per member. The minimum stipend aimed at is £200, which sum was received this year (1878) by those ministers entitled to a share of the surplus fund; the equal dividend being £157.

Suth'erland, the most north-westerly county of Scotland, bounded N. and W. by the Atlantic, E. by Caithness and the North Sea, and S. by Ross and Cromarty. Area, 1,207,180 acres; pop. (1871) 24,317, or 12½ to the sq. mile. The N. and W. coasts, fringed with islets, are bold and rocky, the chief headlands proceeding from the E. being Strathie Point, Whiten Head, Farout Head, Cape Wrath, and Rhu Stoer, in Assynt. The principal inlets in the N. are Strathie Bay, Armadale, and Naver Bay (a favourite anchorage for yachts), Kyle of Tongue, Loch Eriboll (a magnificent natural harbour), and Kyle of Durness; on the W., Lochs Inchard and Laxford (also good harbours), and Edderachylis Bay. About 30 miles off the coast are the Stack and Skerries, much frequented by seals. The E. coast is low and sandy, except in the N. where it rises to the Ord of Caithness. The N. and W. parts of the country are hilly, but the E. is mainly occupied by undulating moors, edged by continuous hill ranges of moderate height. In the W. are Ben More Assynt (3431 feet), and Ben Hee (2859), and near the centre Ben Clibrig (3164). Other mountains, more or less striking in outline, are Ben Quinnag, Canisp, and Suilven or Sugar Loaf. Near Tongue is Ben Loyal, the prettiest hill in S., and W. of it rises the imposing mass of Ben Hope (3061). S. is rich in streams and lakes, the former flowing through straths to which they give name. The Oykel, Shin, Brora, and Helmsdale Water enter Dornoch Firth; the Fleet flows into the Moray Firth at Little Ferry, the principal harbour on the E. coast; the Strathie, Naver, Borgie, Kinloch, Hope, and Grudie flow N., and the Inchar, Laxford, and Inver to the W. Among the inland lochs are Shin (over 16 miles long), Naver, Loyal, Hope, More, and Assynt. Both rivers and lakes abound in trout and salmon,

and there is abundance of game, including deer. There is a conspicuous absence of wood, except along the E. coast, in the lower reaches of the Oykel, and around Loch Inver and the Kyle of Tongue. Some 1000 acres near Loch Shin were planted by the Duke of S. in 1873-76. S. is almost entirely given up to sheep-farming. Many large sheep-farms, some of 70,000 acres, are without a patch that can be cropped. A sheltered strip along the E. coast, extending to 12 miles wide, is the only arable portion, and here agriculture is in an advanced state. In 1876, 10,383 acres were in corn crops, 5058 in green crops, 6691 in clover, sainfoin, and grasses in rotation, and 6018 in permanent pasture, exclusive of mountain and heath. In the same year S. had 228,503 sheep, 13,057 cattle, 2573 horses, and 1239 pigs. The climate in the W. is humid and inhospitable; in the E. it is much milder. Snowstorms, as in December 1878, occasionally impede all traffic, and cause a serious loss to sheep-farmers. In the W. and N. the prevailing rocks are gneiss, mica slate, Old Red sandstone, quartz, conglomerate, and limestone. Granite appears on the borders of Caithness, and around Golspie occur sandstone, limestone, coal, &c. Veins of quartz, calcareous spar, and tremolite, and traces of bog-iron, coal, and manganese, are found in various parts. Gold of superior quality was found in a burn 10 miles from Helmsdale in 1867, and a number of 'diggers' were attracted to the spot, but owing to the labour required the result was disappointing. The Duke of S. began the reclamation of land on a large scale in Strath Terry, N. of Loch Shin, in 1873, partly to provide for the keeping of more sheep in winter. Prior to that date only 5080 acres had been reclaimed, but in 1876 this was augmented by 2074 acres of arable land, and 9120 of pasture. In October 1876 the works extended over other 2024 acres, on which were employed 400 men, 23 steam-engines, and a newly-designed 'S. Land Cultivator.' The reclamations at Lairg (begun 1873 and ended 1877) extended to 2000 acres, out of which several new farms, large and small, have been formed. The S. railway from Bonar Bridge to Golspie was opened in 1878, and under the name of the 'S. and Caithness' railway has since been continued to Wick and Thurso. It owes its existence mainly to the energy and liberal support of the Duke of S., who has invested at least a quarter of a million in it, and it is now called the 'Duke of S.'s railway.' There are no manufactures, but the coast fisheries, which centre in Helmsdale, yield annually some 50,000 barrels of herrings, besides large quantities of white fish, cod, ling, mackerel, lobsters, &c. The salmon-fishings are also important. Dornoch (q. v.) is the chief town. Almost the whole county belongs to the Duke of S., and the valued rental in 1877-78 was £91,844. S. is the 'Southern Land' of the Northmen, who overran it prior to the 12th c. It returns one member to the House of Commons.

Suth'erland, the ducal title of the Leveson-Gowers, the 'luckiest of the great English families.' The Gowers trace their descent from a Norman named Guhyer, who shortly after the Conquest obtained the manor of Sittenham, in Yorkshire, the seat of a line of 'great squires and good soldiers.' A baronetcy was obtained from James I., and the second baronet, a leading partisan of Charles I., married a daughter of Sir John Leveson of Halling, in Kent, while the fourth baronet was adopted heir of Sir Richard Leveson of Trentham, in Staffordshire. With the Stafford estates the family took the existing name of Leveson-Gower. Sir William, who was one of the bail for the Duke of Monmouth in 1683, married a daughter of John Granville, Earl of Bath, who inherited the family estates. Sir John Leveson-Gower was raised to the peerage by Queen Anne, and was one of the Commissioners who concluded the union of England and Scotland. The second Baron Gower was elected president of the Jacobite 'Board,' *vice* the Earl of Lichfield in 1742, and in the same year Lord-Lieutenant of Stafford and Lord Privy Seal. It is said he held the two offices simultaneously, and in his own time he was regarded as such a turncoat that Dr. Johnson gave 'a Gower' as a synonym for 'renegade,' but abandoned the phrase on the objection of his printer. On the outbreak of '45 he raised a regiment of foot for King George, and as a reward was created Viscount Trentham and Earl Gower, 8 July 1746. He continued to hold the Privy Seal till his death, 25th December 1754. His eldest son, Granville, Lord Trentham, was made Lord Privy Seal in 1755—'a great promotion,' says Walpole, 'for so young a man.' Acting with the Bedford party, he became President of the Council (1767), an office he retained under Lord North. But in 1779 he resigned, disapproving of the continued war with the colonies. In 1782 he was asked by the king to form a new cabinet. This invitation, and a similar one in 1783, he declined; but when Pitt became First Lord of the Treasury he volunteered his service, and at once was made President of the Council, and in 1784 received the Privy Seal, which he held till 1794. On the recommendation of Pitt he was created Marquis of Stafford in 1786. He had married a daughter of Scroop, first Duke of Bridgewater, and died 26th October 1803. George Granville, the second marquis (born 1758), eclipsed the fortune of all his ancestors. On the 4th September 1785 he married Elizabeth, Countess of S. and Baroness of Strathnaver, Scotland, heiress of William, 17th representative of the Earldom of S., the oldest in Great Britain, dating from 1275. The title of the Countess, who had been an orphan from an early age, was disputed, but after various proceedings the House of Lords confirmed it in 1771. The Marquis thus became possessor of one-half of Sutherlandshire, and shortly purchased most of the country remaining. The famous 'S. clearances' were effected with the view of devoting the county to sheep-farming. The evictions, though causing hardship to individuals, were conducted in a kindly spirit, the old tenantry receiving grants in more fertile parts of Scotland and in Canada. The result has been an increase in the population and wealth of the county as well as a rise of rentals. The death of Francis, Duke of Bridgewater, in 1803, brought to the Gowers the estates of that family in Lancashire, Shropshire, Stafford, &c., which descended to Lord Leveson-Gower, who was created Earl of Ellesmere in 1846. Throughout early life the Marquis acted with Pitt, on whose death he attached himself to Lord Granville, but eventually joined the Liberal party. After the Reform crisis he was created Duke of S., 14th January 1833, and died 19th July following. His eldest son, George Granville, second duke, was a consistent Whig, but took little part in public affairs. The Duchess, a daughter of the Earl of Carlisle, swayed the great power of the house, a power increased by her position as Mistress of the Robes. Her large family were singularly fortunate in alliances, and the third and present Duke, George Granville William (born 1828), who succeeded in 1861, stands at the head of a family group which includes the Duke of Argyll, the Duke of Leinster, the Duke of Westminster, the Earl of Ellesmere, and Earl Granville. In 1841 the Duke married Anne, heiress of John Mackenzie, Esq., of Newhall and Cromartie, and in 1861 she was created Countess of Cromartie, Viscountess Tarbat, and Baroness Macleod and Castlehaven, with remainder to her second son, Francis, Viscount Tarbat by courtesy. The Duke, who lodged Garibaldi at Stafford House in 1864, has contributed £336,000 to the opening up of the northern counties by railway. In 1878 the estates amounted to 1,176,837 acres, of which only 26,837 were cultivated, but it is estimated that the arable portion may be increased to 50,000 acres. The Duke is at present engaged in a great work of land reclamation, described under SUTHERLANDSHIRE. See *The Great Governing Families of England*, by Sanford & Townsend (2 vols. Edin. 1865).

Sut'lej (*Satlaj*), the easternmost of the five rivers of the Punjaub, in N.W. India, identified both with the Zaradras and the Hypanis of the Greeks. It rises in the lake of Manasavara, amid the central Himalayas, nearly 20,000 feet above the sea-level, and first flows N.W. for about 200 miles through stupendous mountain gorges; it is then joined by the Spiti, a tributary larger than the main stream, and turns S.E. In this part it is occasionally crossed by suspension-bridges of rope and of iron. Passing Rampur and Bilaspur, it enters the plains of the Punjaub at Rupur, where it is 30 feet deep and more than 500 yards wide in the rainy season. It receives the Beas a little above Sobraon (q. v.), after a total course of 550 miles. Thenceforth the united stream is known as the Charra, taking the new name of the Punjnud after its junction with the Chenaub, up to the point where it finally empties itself into the Indus opposite Mittunkote. The principal town on its banks is Ferozpur. Its waters are largely used for irrigation, and the Sirhind Canal (q. v.) will afford, when completed, a navigable communication with the Jumna. It is celebrated in history as forming the E. frontier of the Punjaub, within which Runjeet Sing was confined. The crossing of the S. after his death by the Sikh army occasioned the first Sikh war of 1843, and on its banks many bloody battles were fought. The Upper S. canals have a total length of 213

miles, and irrigate 135,439 acres in the districts of Lahore and Montgomery. It is proposed to extend this system by a dam across the river at Ferozpur, at an aggregate cost of 3½ millions sterling. The Lower S. and Chenaub canals, in the Multan district, are 632 miles long, and water 242,504 acres.

Sut'ler (Old Dut. *sœteler*, 'a smaller trader'), a person who follows an army in order to purvey to them provisions, liquors, &c. In the British army a S. requires permission from the Quartermaster-general to follow the army, and, like all camp-followers, is subject to martial law and the Articles of War. The sutlers attached to regiments in the French army are called vivandiers.

Suttee' (Sansk. *sati*, 'a virtuous woman'), the term applied in India to the wife who immolates herself on the tomb of her deceased husband. This practice is known to have prevailed from remote antiquity, though it is now alleged to be based upon a mistranslation of a text in the Vedas. There are sacred spots throughout the country dotted with little pillars commemorating the self-sacrifice; and there can be no doubt that it is still looked back upon with half-approval by the great mass of the Hindu community. On 29th December 1829, Lord William Bentinck, with the advice of Mr. B. Bayley and Sir C. Metcalfe, promulgated the celebrated enactment making it a punishable crime to aid or abet a S. It is said that 600 victims before that date used annually to perish in Bengal alone. Now it is believed that the practice is eradicated even in the native states of Rajputana, where it lingered longest; though even in British territory a widow occasionally violates the law by stealth. A provision against S. figures prominently in the treaties made by the British with the feudatory Rajahs. On the death in 1877 of Jung Behaudur, the prime minister of Nepal, several of his wives are said to have committed S.

Su'ture (Lat. *sutura*, 'a seam'), the name applied in anatomy to the lines of union of the cranial bones and those of the skull. The sutures in man's skull are observable in adult life, and also in the skulls of mammals save the lowest; but in birds the bones of the cranium become firmly anchylosed, and thus obliterate the S. The sutures of the human skull are divisible into three series—those at the vertex, those of the side, and those at the base. Of the first mentioned, the *sagittal* or *interparietal S.*, the *coronal S.*, and *lambdoidal S.* are examples. Those at the side of the skull are also three in number—*spheno-parietal*, *squamo-parietal*, and *masto-parietal*; and the sutures of the base include the *Basilar S.*, the *petro-occipital*, *masto-occipital*, and others on each side.

In *Surgery* a S. designates various modes of sewing up wounds so as to maintain the opposite surfaces in contact, and thus secure union with the smallest possible cicatrix or mark. Needles of various shapes and sizes are employed, according to the various peculiarities of the parts to be operated on, but the round form of the ordinary sewing-needle is objectionable, as it leaves a large mark. The bayonet-pointed needle, used by glovers, perforates the skin much more readily, and leaves a much smaller cicatrix than the ordinary form of needle. Various kinds of material are used for the formation of the S., such as silver-wire, catgut, horse-hair, silk, cotton, and hemp. The silver S. is now in universal use, and is superior to any other if the S. is to be allowed to remain long in; but if it is to be removed soon after the operation, silk is preferable, as it can be removed without pain or difficulty.

Suvor'off-Rymnik'ski, Count Peter Alexei Vasiljevitch, Prince Italijski, Russia's most celebrated general, was born in Finland, November 25, 1729, of a family of Swedish extraction. He distinguished himself in the Russian service during the Seven Years' War, in Poland in 1768, against the Turks in 1773, and especially in the war of 1787-92, in which, in conjunction with an Austrian army, he gained the victory of Fokshani (1789). The same year, alone, his troops decisively defeated the Turkish grand vizier at Rymnik, for which he received the surname of Rymnikski, and in 1790 he stormed Ismail with fearful bloodshed. After the peace he was made governor of the provinces taken from the Turks. Having completed the subjugation of Poland in 1794 with the bloody capture of Praga, Warsaw's strongly-fortified suburb, he wrote the despatch announcing his victory to Catharine in but three words in his peculiar laconic manner: 'Praga, Hurrah! Suvóroff!' which drew from the Empress the answer: 'Bravo! Field-marshal! Catharine!' Violent and unyielding as S. was in battle, in peace he was mild and gentle. On his estate he delighted to live a patriarchal life in the bosom of his family. In 1799 the Emperor Paul set S. over the Russo-Austrian army, with the command to drive the French from Italy, and that he did by the victories of Cassano, Trebia, and Novi (April-August 1799), which were rewarded with the title of Prince Italijski. Variance between the Russian and Austrian generals leading to the decision that each nation should undertake an independent war, S. proceeded to Switzerland against Masséna. Though he there displayed all his former ability and activity, the Russians suffered great losses. He evacuated Switzerland, and was recalled to Russia with all his forces. His enemies influencing the pliant mind of Paul, S. fell into disfavour, the bitterness of which aggravated a sickness from which he suffered, so that he died (May 18, 1800) sixteen days after his return to St. Petersburg. See his correspondence, edited by Fuchs (2 vols. Glogau, 1835), and the biography of Polevoi (Ger. trans. Mitau 1853), and Rybkin (Mosc. 1874).

Su'zerain (Fr. from *sus*, Lat. *susum*, *sursum*, 'above,' on the analogy of *souverain*), a title borne in the days of Feudalism (q. v.) both by the king and his immediate vassals—by the former as original holder, according to legal fiction, of all the realm; by the latter, as grantors in their turn to *arrière*-vassals.

Swale, a tributary of the Yorkshire Ouse, rises on the borders of Westmoreland and Yorkshire, under Shunner Fells, and after a south-easterly course of 60 miles, unites with the Ure at Aldborough to form the Ouse. It is navigable for 8 miles above its junction with the Ure.

Swall'ow (*Hirundo*), a genus of *Insessorial* birds, exemplifying the *Fissirostres* or 'cleft-beaks,' and serving as a typical example of the family *Hertundinidæ*, in which the bill is shut with a broad base, the nostrils rounded, the wings long, with their first quills longest, and the tail forked. Of this genus the chimney S. (*H. rustica*) is the familiar species. Its average length is about seven inches, the back and wings are of a steel-blue colour, the top of the head is a ruddy chestnut, the tail and secondary feathers are black, and the throat is chestnut-brown. White and pied swallows are occasionally found. The S. is swift and active in all its movements. It pursues its insect prey on the wing, and is assisted in its captures by the bristles which fringe the wide 'gape.' The song is a mere twittering note. The nest is built usually in a disused chimney or some similar situation, and is made of mud or clay, lined inside with feathers and soft grasses. The eggs number from 4 to 6. They are of a white colour spotted with red, and two broods are usually produced in the year. The S. migrates to Africa at the end of October, but some members of the species remain in Europe all winter. In April the flight northward takes place. The house martin or window S. (*H. urbica*) is known by its white under colour. The nest is built under the eaves of houses. In America the *H. erytrogaster* or red-bellied S. takes the place of the common S. of Europe. The fairy S. (*H. ariel*) is a S. Australian species. The white-bellied S. (*H. viridis*) is also common in the United States. Other genera of Fissirostral birds including swallows are *Collo-calia*, to which belongs the *C. nidifica* or esculent S. of the Chinese; *Progne*, including the *P. purpurea*, the purple S. or purple martin of N. America; *Cotile*, including *C. riparia*, the sand S. or Sand Martin (q. v.). Other birds to which the name of S. is applied are the fern S., also known as the 'sea S.,' and the name wood S. is given to the *Artamus sordidus*, a dentirostral bird nearly allied to the Shrike (q. v.).

Swall'owing, Act of. See DEGLUTITION.

Swallow-Tailed Butterfly and **Moth**, the name of the *Papilio Machaon*, a large and beautiful genus of butterflies, and of the *durapteryx Sambucaria*, a common British moth. In both insects the hinder wings are prolonged to form pointed tails or projections, from which their popular names are derived. The larva of the S.-T. M. is of a reddish colour, and is usually found on such trees as willows and elders.

Swall'ow Wort. See ASCLEPIAS.

Swamm'erdam, Jan, a Dutch naturalist, was born at Amsterdam, February 12, 1637. He studied chiefly at Leyden and Paris. Settling at Amsterdam, he devoted himself mainly to the study of natural history. He made important investigations into the development of insects, and was the first to preserve vessels of dissected bodies by injecting with wax. Towards the

close of his life he came under the influence of Madame de Bourignon, a religious fanatic, gave up his studies, and died, a victim of melancholy, at Amsterdam, February 15, 1685. S. was the author of several treatises on respiration, on the natural history of animalculæ, on generation, &c.; but his great work is *Biblia Naturæ, sive Historia Insectorum in certas Classes redacta* (3 vols. 1737-38; Ger. trans. 1752, English 1758, French 1758), a work which, left unfinished, was completed by Thevenot, and published by Boerhave.

Swan (*Cygnus*), a genus of *natatorial* birds, having a bill of moderate length, a soft cere, the hinder toe unwebbed, and no under-lobe. The cere extends in the S. quite to the eyes, and the wings have their second and third quills longest. The legs are short, and the neck extremely long, the cervical vertebræ numbering twenty-three. The *Cygnus olor* is the common mute or tame S., and is the only species resident in Britain. The plumage is white, but that of the young or *cygnets* is a bluish-grey. Bewick's S. (*C. minor* or *Bewickii*) has an orange patch at the base of the bill. The whistling or hooper S. (*C. ferus*) is so named from the shrill grating note, produced by the peculiar and contorted shape of the *trachea* or windpipe. It arrives in Britain in winter, and migrates northwards in March and April. The average length of the common S. is three or four feet. The eggs are of a greenish-white colour, and number from five to seven. Other species of S. are the Polish S. (*C. inimitabilis*), the black or Australian S. (*C. atratus*), the American S. (*C. Americanus*), the trumpeter S. (*C. buccinator*), also an American form; and the black-necked S. (*C. nigricollis*) of S. America. From an early date the S. has been protected by royal decree. In Henry VII.'s time the theft of a swan's egg was punished by imprisonment, and the bird was deemed 'royal,' no subject being allowed to preserve it save by special permission of the sovereign. A mark or badge was granted to those who enjoyed this right, and the ceremony of 'S.-upping' or S.-marking is carried out to this day on the Thames on the first Monday in August of each year on behalf of the Crown, of the University of Oxford, and several of the London companies or guilds.

Swan'age Clay, a thin deposit of Middle Purbeck age, very remarkable for the fossil remains of mammalia which it contains, about fifteen species having been described by Dr. Falconer and Professor Owen. Only about eight species besides have been obtained from the whole range of Secondary rocks. They appear for the most part to be referable to insectivorous marsupials.

Swan River, a considerable stream in W. Australia, to which settlement it originally gave name. It enters the Indian Ocean in 32° S. lat., and is there 1000 feet wide. A rocky bar prevents large vessels from entering, but the anchorage inside is safe. The town of Freemantle (pop. 3500) is situated at the mouth of the S. R., and Perth (q. v.), the capital of the colony, 12 miles higher up.

Swan'sea (Cymr. *Abertawe*), a seaport of Glamorganshire, and the capital of S. Wales, 32½ miles W.S.W. of Merthyr Tydvil by rail, stands on the W. bank of the Tawe, at its entrance into S. Bay. It has nine Anglican and two Roman Catholic churches, besides innumerable chapels, but none of them are ancient or of much architectural beauty. The public buildings include a Corinthian guildhall (1827-46); the Royal Institution of South Wales, Ionic in style, with a library, theatre, and museum (1840); a post-office (1857); public hall (1864); market (1830), 320 by 220 feet, and fishmarket (1847); infirmary (1867); and Bishop Gore's School (founded 1682; rebuilt at a cost of £10,000, 1852-62), which in December 1878 had 5 masters and 87 boys. A public park of 45 acres, the third belonging to S., was presented by Mr. J. D. Llewellyn, 3d October 1878; and the Great Western Company completed (1879) a new station, in Early English style, with platforms 430 feet long. Besides the tidal harbour, 215 feet wide and formed by two piers 900 and 300 feet in length, there are the N. Dock of 10½ and S. Dock of 13 acres, the total cost of the harbour works having nearly reached £500,000. In 1877 there entered 5075 vessels of 704,914 tons, and cleared 6857 of 975,079 tons; and on 31st December 293 ships of 81,472 tons were registered as belonging to the port, besides 144 fishing-boats. The exports amounted to £674,660 (in 1873, £1,855,712); the customs to £10,458; and the imports to £2,122,737, the last including 93,375 tons of copper, 13,850 tons of iron or copper pyrites, 22,240 cwts. of saltpetre and cubic nitre, 331,237 cwts. of corn, 123,579 cwts. of potatoes, 84,083 loads of timber, 11,200 lbs. of wool, &c. Copper-smelting is the great industry of S., which receives three-fifths of the copper-ore imported into the United Kingdom; next ranks the export of minerals from the surrounding districts—viz. (1877), coal to the value of £344,623, and iron to that of £174,312. There are also important breweries, potteries, shipyards, iron and brass foundries, chemical and patent fuel works, &c., but S. is suffering greatly from the general depression of trade and the great colliery strike of 1875. It publishes three weekly newspapers (of which the *Cambrian* is the oldest in the Principality); and with the neighbouring towns of Neath, Longhor, Aberavon, and Kenfig returns one member to Parliament. Pop. (1871) 51,702. In 1113 Henry Beaumont, Earl of Warwick, erected S. Castle, whose massive square tower alone remains; but S. owes its present importance to the establishment of copper-works in 1719. See Nicholas' *History of Glamorganshire* (Lond. 1874).

Swat'ow, or **Chau-Chou**, a seaport of China, province of Quang-tung, 212 miles E.N.E. of Canton. It was opened to foreign trade by the Treaty of Tien-tsin, and exports sugar, rice, tobacco, &c., in exchange for opium, woollens, cottons, cotton yarns, and metals. In 1874 the total exports amounted to £1,311,532 and the imports to £3,318,508. The trade direct with foreign countries amounted to £2,234,567, and to other treaty ports to £2,395,473. Of the imports, £2,062,839 worth were from Hong Kong. S. is situated at the mouth of the Han, on a sheltered bay, and has a pop. of some 400,000.

Sweat (Old Eng. *swát*; comp. Lat. *sudor*, Gr. *hydor*, Sansk. *svaidas*), the name given to the *perspiration* or skin-secretion separated from the blood by the *sudoriparous glands* or S. *glands*. (See SKIN.) The ordinary perspiration is named *insensible* on account of its being continually given off from the skin by evaporation; the increased secretion of S. dependent on exertion, and which appears in the form of drops of fluid collected on the surface of the skin, being named *sensible* S. This secretion consists of water, carbonic acid, urea, mineral matters, and *sebaceous matter*—the latter obtained from the glands of that name existing in the skin. The principal salts in S. are the chlorides of sodium and potassium, with alkaline phosphates, and sulphates. Traces of oxide of iron also occur in the secretion. The quantity of watery vapour daily excreted by the skin under ordinary circumstances amounts to between 1½ and 2 lbs. Occasionally in some diseases (*e.g.*, jaundice) the S. may be coloured by other secretions, whilst *sanguineous* or *bloody* S. is not unknown; the cause of its production being, however, obscure.

Sweat'ing Sick'ness, The, an extremely fatal epidemic disease which made its appearance in England in August 1485, and which ravaged Europe throughout the 15th and 16th centuries. Its true origin is unknown; but it may have sprung from some of the epidemics which prevailed on the continent of Europe about the time of its appearance in England. In 1477 the bubonic plague broke out in Italy, and raged without interruption till 1485. Following in the train of drought and famine, malignant epidemics appeared in Switzerland and Southern Germany; and putrid fever, with phrenitis, in Westphalia, Hessen, and Friesland. In 1482, after two years of famine, France was the scene of a devastating plague of inflammatory fever with delirium, probably identical with that which, at the same time, ravaged the N.W. of Germany. In 1484, Germany and Switzerland were again the scene of devastating epidemics. At this period England was free from any great epidemic disease. On the 25th July 1485, the Earl of Richmond, at the head of 2000 men composed of a small subsidy of French troops and wandering freebooters, sailed from Havre, and seven days after landed at Milford Haven. At about the middle of August, the army, which had been augmented to about 5000, encamped in a low, damp situation at Litchfield, till it broke up for the neighbouring field of Bosworth, and at this period the S. S., or, as it was first called, 'the new disease,' made its appearance. After the victory of Bosworth, Henry hastened to London, attended only by a select body of followers; and the remainder of the army halted in the neighbouring towns, and were probably disbanded according to the custom of the age. On the 21st September the S. S. appeared in London as a violent epidemic, and continued to the end of the following month, a period of about five weeks. Hecker says:—'By the end

of the year, the disease had spread over the whole of England, and visited every place with the same severity as the metropolis.'

The S. S. is described as a violent inflammatory fever, which, after a short rigor, prostrated the powers as with a blow, and amidst painful oppression at the stomach, headache, and lethargic stupor, suffused the whole body with a fœtid perspiration. All this took place in the course of a few hours, and the crisis was always over within the space of a day and a night. The internal heat which the patient suffered was intolerable.

The treatment then adopted was, 'not to resort to any violent medicines, but to apply moderate heat, to abstain from food, taking only a small quantity of mild drink, and quietly to wait for four-and-twenty hours the crisis of this formidable malady. Those who were attacked during the day, in order to avoid any chill, immediately went to bed in their clothes, and those who sickened by night did not rise from their beds in the morning, while all carefully avoided exposing to the air even a hand or foot. Thus they anxiously guarded against heat or cold, so as not to excite perspiration by the former, nor to check it by the latter, for they well knew that either was certain death.'

In the years 1506, 1517, 1528, and 1551 this mysterious epidemic again ravaged England, with varying degrees of violence. In 1528 the French army was destroyed before Naples by a pestilence, probably a *malignant petechial fever*, and France was decimated by a highly inflammatory fever called *Trousse-Galant*. On July 25, 1529, the S. S. broke out in Hamburg, where it destroyed within twenty-two days 1100 inhabitants. The total mortality in Hamburg was estimated at 2000. The disease subsequently raged with great virulence in Lubeck, Zwickau, and at the beginning of September it broke out at Stettin, Danzig, and other Prussian cities, Augsburg, Köln, Strassburg, Frankfurt, Marburg, Göttingen, and Hanover. Towards the close of September it appeared in the Netherlands, Denmark, Sweden, and Norway, and spread over the Scandinavian Peninsula. It likewise penetrated into Lithuania, Poland, and Livonia, and probably into Russia. No trace of the epidemic is to be discovered later than December 1529, the disease having lasted about three months. Hecker says that the alarm which prevailed in Germany surpasses all description, and bordered upon maniacal despair. The history of the epidemic in England in 1551 was written by Dr. John Kaye or Caius, who was present in Shrewsbury during the prevalence of the epidemic. See *Epidemics of the Middle Ages*, by Dr. J. F. C. Hecker, translated by the Sydenham Society (Lond. 1864).

Sweden (Swed. *Sverige;* Norw. and Dan. *Sverrig*), a kingdom of N. Europe, occupying the E. part of the peninsula of Scandinavia (q. v.), bounded N. by Norway and Russia, W. by Norway, the Cattegat, and the Sound, S. by the Baltic, and E. by the Baltic, the Gulf of Bothnia, and Russia. It lies between 55° 20′ and 69° 4′ N. lat., and between 11° 9·8′ and 21° 9′ E. long., its extreme length being 990 miles, and breadth 264 miles. S. is divided into län or provinces, whose area and population were as follows, according to the census of 31st Dec. 1877:—

Län.	Area in sq. miles.	Pop. (1877).	Län.	Area in sq. miles.	Pop. (1877).
Götaland—					
Malmöhus	1846	543,074	Stockholm	2994	140,606
Christianstad	2506	230,869	Upsala	2052	107,121
Bleking	1164	134,005	Södermanland	2630	143,929
Halland	1899	133,988	Vestmanland	2622	126,753
Kronoberg	3840	168,031	Örebro	3520	181,236
Jönköping	4463	193,113	Värmland	7343	268,557
Kalmar	4436	241,939	Kopparberg	11,417	189,650
Gotland	1203	54,964	Lake Mälar	442	
Götheborg & Bohus	1952	252,952	„ Hjelmar	176	
Elfsborg	4047	288,963	*Norrland—*		
Skaraborg	3505	256,712	Gefleborg	7416	169,194
Östergötland	4241	268,584	Vesternorrland	9527	155,134
Lake Vener	2149		Jemtland	19,588	78,381
„ Vetter	733		Vesterbotten	20,935	101,449
Svealand—			Norrbotten	40,551	86,655
Stockholm (city)	12	165,677	Total	159,909	4,484,542

The only colony of S., St. Bartholomew in the Antilles, was purchased by France, October 31, 1877. The emigrants from S. in 1861–70 averaged 1690 annually, in 1870 numbered 29,003, and in 1876, 9418.

Physical Aspect.—From Kjölen Mountains (q. v.), the watershed between S. and Norway, S. stretches in terraces to the Baltic. The descent from 4500 to 2000 feet occupies a fifth part of its entire breadth. Under this lies a zone 60 miles broad and 2000-800 feet high, with river-valleys 2½–5 miles wide, and numerous lakes. This again is succeeded by another still broader, and 800–300 feet high, from which a strip 28 miles broad stretches down to the Baltic shore, here in gradual declivity, there in sudden falls of from 65 to 160 feet. The gradual rise of S. from the sea has been estimated by Sir Charles Lyell at an average of about 40 inches in a century during the historical period. From Lake Fämund on the Norwegian frontier extends the chief mountain chain of S., first E., then South, throughout Central and South S. Although so much lower than the cliffs, the mountains of S., owing to their more northern latitude, are covered with perpetual snow, but the round-topped granite summits give to the inland mountain scenery an appearance of tameness and monotony. South of the great lakes of the Svealand lowlands rise the wooded ridges of Tiveden, Tylöskogen, and Kolmarden, averaging 515 feet high. The part of Götaland to the south of Lake Vetter forms the plateau of Smaland (1164 feet), from which the country slopes E. to the Baltic, W. to the Cattegat, and south to the plain of Skaane (1133 feet high). Near the Norwegian boundary rise Sulitjelma (6489 feet), and Syltoppen (6180 feet), the highest peaks in S. Areskutan in Jemtland is 5098, and Städjen in Dalarne 3399 feet high. Numerous small islands ('Skärgard') skirt the coast of S. Their aggregate area is 868 sq. miles. S. is peculiarly rich in lakes, which amount in area to 13,913 sq. miles. The greatest of these is Vener, the largest lake in Europe after Ladoga and Onega. Others are Vetter, Mälar, Hjelmar, Siljan, Storsjön, and the great lakes of Lapland. The rivers of North S. run parallel to each other from N.W. to S.E. Chief of these are the Tornea, forming the boundary with Russia, the Kalixelf, Luleelf (272 miles), Piteelf (225 miles), Byskeelf, Skellefteelf, Umeelf (270 miles), Angarmannaelf (285 miles; 60 navigable), Indalself, Ljungan, Ljusnelf (225 miles), Dalelf (308 miles), S.'s largest river, and the Motalaelf, which discharges into Lake Vetter. The rapidity of all of these makes them of small importance for navigation. The Götaelf, the exit of Lake Vener, is through the Göta Canal the most important river of S., being thereby rendered navigable in its upper course (the Klarelf). Of the rivers of South S. the chief are Viskan, Attran, Nissan, Lagan, Helgean, and Emman. Of the numerous waterfalls formed by the rivers and lakes of S., especially noteworthy are Njommelsaska or Harspranget in the Luleelf (391 feet high), and Trollhättan (110 feet) in the Götaelf; the falls in the Motalaelf and Mölndalsan supply valuable water-power.

Climate, Geology, and Mineralogy.—The Swedish shore, on the Gulf of Bothnia, is now rising at the rate of 3 feet in a century, while in the south of S. it is sinking. The climate of S. is very diverse, by reason of its great length and varying elevation. While at Lund and Götheborg the mean temperature is 43°–45·5° F., and in Skaane as in Gotland the vine and mulberry can endure the winter, the N. parts of Lapland have a mean temperature of 30°–27° F., and at a height of 3000 feet no tree can grow. On the E. coast the winter is colder and the summer warmer than on the W. The annual rainfall in Central S. averages 20⅞ inches. Granite, gneiss, and eurite, yielding lime and aluminous slates, occur in Vestergötland, Nerike, Östergötland, Öland, Dalarne, Jemtland, Gotland, and Skaane. In the N.W. of Skaane occur Secondary formations containing coal. Iron is found in Örebro, Kopperberg, Värmland, Vestmanland, Upsala, Stockholm, and Gefleborg. The mine of Gellivara in Norrbotten consists wholly of magnetic iron ore. In Smaland iron ore is found in mosses and lakes. The copper mines, of which the largest are the 'Great Mine' in Dalarne and Atvida in Östergötland, yielded, in 1874, 28,828 metric tons. More important is the production of nickel (at Klefva in Smaland and Sagmyra in Dalarne), lead, sulphur, vitriol, alum, and especially zinc (in Nerike and Östergötland). Other mineral products are cobalt, manganese, porphyry, and marble.

Botany and Agriculture.—After Russia and Finland, S. has more forest land in proportion to its area than any country of Europe. The forests covered in 1876, 40,704,934 acres, or 40 per cent. of the surface, and consist chiefly of pine and fir, with birch, alder, and ash. In 1877 were exported 640,000 planks,

and 100,000 logs. The oak grows no farther N. than the Dalelf, and the beech is not found farther S. than Lagan. The flora of S. is singularly rich, and consists of over 2300 species in 463 genera, probably more than any other country of Europe. Agriculture is the chief support of the people, though only 5¾ per cent. of S. is arable land. In 1876 the crop of oats in S. was 35,637,911 bushels, of rye 16,138,522, of barley 11,820,332, of wheat 2,716,357, of mixed corn, 4,430,916, of potatoes 46,040,731, and of beans and pease 1,580,828. The chief other products are beet, flax and hemp (57,981 cwts. of fibre in 1876), hops, rape, and tobacco.

Zoology and Live Stock.—The wild animals of S. include the bear, wolf, lynx, glutton, fox, marten, ermine, and otter. The elk is found in Central S., deer, squirrels, and hares abound, and lemmings roam on the mountains. Moor and mountain fowl, the snipe, wild goose, and swan are common. The rivers of S. are rich in salmon. Cod and sprats are caught in the Baltic. The herring-fishery of Bohuslän, last century considerable, is now succeeded by that of cod, mackerel, flounders, lobsters, and oysters. In 1876 S. had 460,757 horses, 2,189,216 cattle, 1,588,541 sheep, 431,671 pigs, and 120,234 goats.

Industries.—S. had, in 1873, 2549 manufactories, employing 53.334 workpeople, and producing goods to the value (in 1874) of £10,472,000. The mining industry is one of the most important, and is making great progress by the introduction of new machinery. In 1876 there were produced 18,996,654 cwts. of iron ore from mines, besides 351,354 cwts. of 'marsh iron' from lakes and bogs. In the same year were produced 8,083,551 cwts. of pig-iron, 4,466,355 cwts. of bar iron, 1,402,835 cwts. of steel, 571,528 cwts. of cast-iron goods, 22,468 cwts. of copper ore, 744,388 cwts. of zinc ore, and 1734 lbs. of silver. The iron industry occupied, in 1876, 24,174 persons (421 females), 5887 being employed in the mines, 6093 in the foundries, and 7496 in the rolling mills. The furnaces in blast numbered 205. The best Swedish iron is manufactured at Dannemora (q. v.). In the latter half of 1877 the 'Iron Goods Co. Limited' of Tunafors started a cutlery factory, which by the end of the year had produced 25,303 dozen knives and forks. The average annual production of sugar in the period 1871–75 was 39,202,679 lbs., or 65 per cent. of the whole consumption in S., and that of cotton yarn 14,479,573 lbs., while that of cloth was valued at £717,496, of glass at £151,192, of porcelain at £116,298, lucifer matches at £243,144, and paper £416,525. The other industries of S. are shipbuilding, distilling, brewing, and the manufacture of woollens, linens, and tobacco.

Commerce, Railways, &c.—The trade of S. is steadily improving, mainly owing to the gradual departure from the protective tariff that obtained till 1857. In the period 1856–75 the average value of the imports of S. was £7,788,575, and of the exports £6,981,914. The customs in 1877 amounted to £1,444,500. The commerce with Great Britain is twice as great as that with any other country. In 1877 the exports of S. to Great Britain amounted to £7,859,812, including wood and timber valued at £4,390,417, iron and steel at £1,127,341, oats at £1,329,359, wheat, barley, and other cereals at £181,635, butter at £238,575, cattle at £103,235, and paper at £100,080; while the imports from Great Britain were in all worth £3,902,324, including iron valued at £507,958, coal at £413,913, bacon and hams at £365,790, coffee at £343,720, raw cotton at £256,208, cottons and cotton yarn at £211,705, woollens and woollen yarn at £221,122, unrefined sugar and molasses at £156,330, and machinery at £175,581. The total burden of Swedish vessels which entered and cleared at ports in the United Kingdom in 1877 was 1,090,563 tons (steam vessels 446,465 tons), while the total tonnage of vessels of all nations entered and cleared in S. in 1875 was 5,279,849 tons (66 per cent. foreign bottoms). The aggregate tonnage of the Swedish merchant navy at the close of 1877 was 507,049 tons (steam vessels 83,007 tons). At the close of 1877 there were 1011½ miles of state railways in S., and 2104⅜ of private lines. The Diet of 1878 has voted for an extension of the state railways £369,445, and £166,600 for the completion of those already in use. There are in S. 466 miles of navigable canals, of which the chief is the Trollhätta and Göta Canal, between the Baltic and the Cattegat. In 1877 there were 5135 miles of telegraph in S., with receipts amounting to £73,804.

Government and Legislature.—The constitutional laws of S. are the Acts establishing the form of government (1809), the hereditary succession (1810), the liberty of the press (1812), and the national representation (1866). The king must be a member of the Established Lutheran Church. His person is inviolable. The executive is in his hands, acting under the advice of a council of ten ministers, seven of whom form the cabinet. The Diet consists of two Chambers, the first composed of 133 unpaid members, or one to every 30,000 of the pop., the second of 198 salaried members, in the proportion of 1 to every 10,000 in towns, 1 for every *domsaga* or rural district with less than 40,000 inhabitants, and 2 for every *domsaga* that has more than that number. The supreme court of S. is composed of the king and sixteen counsellors of justice. Under it are three courts of the second instance (at Stockholm, Jönköping, and Christianstad), and the military high court.

Finance.—The revenue is derived one-third from direct taxes and Government property, and two-thirds from indirect taxation, customs and excise duties, and the tax on spirits. The budget of 1878 showed an expenditure for 1877 of £4,782,778, and the estimate for 1878 put the revenue at the same amount. On January 1, 1878, the public debt was £10,119,838, exclusively spent on railways.

Army and Navy.—The army is composed of (1) *Värfvade* troops enlisted for six years; (2) *Indelta*, or national militia, paid and kept by the landowners; (3) the *Gotland militia*; (4) the *Beväring*, or conscripts, levied from the male population between twenty and twenty-five. At the close of September 1877 the entire forces were 122,122 infantry, 8011 Gotland militia, 8569 cavalry, 7542 artillery (serving 234 guns), and 836 engineers, in all 147,180 men. There is also a body of volunteers, first organised in 1861, amounting (September 1877) to 13,166 men. At the same date the fleet consisted of 14 ironclad vessels (4 monitors with 8 guns), 25 unarmoured ships of the line, 7 sailing vessels, and 89 galleys, having in all 380 guns and 5296 men, while the naval *Beväring* numbered 40,000 men.

Education and Religion.—Education in S. is gratuitous and compulsory. In 1875 there were 8123 primary schools, with 606,875 pupils, and in 1872, 98 secondary schools, with 12,356 pupils and 976 teachers. S. has two universities, at Lund (q. v.) and Upsala (q. v.), 31 agricultural and 9 technical schools, 8 schools of forestry, 9 of navigation, and 2 large industrial schools in Stockholm and Gotheborg. The vast majority of the people are Evangelical Lutherans, the enumeration of 1876 showing but 6440 dissidents, of whom 573 were Roman Catholics and 1836 Jews. The followers of Swedenborg (q. v.) are tolerated within the National Church.

History.—The earliest inhabitants of S., as of all Scandinavia (q. v.), appear to have been Finnish peoples, who in prehistoric times were driven northwards by Teutonic races from Ey-gotaland or the Danish islands. According to the *Ynglinga Saga*, Odin founded the empire of the Svea, named by him the lesser Svithjód, and built a temple at Sigtuna, near Lake Mälar. He found in S. a people named Gota or Gauta, who also had originally come from Svithjód. The two peoples settled side by side as the two free nations of the Svea and the Göta. The Svea gradually became the more powerful, and their chiefs came to be regarded as chief kings by all the Smaa-kongar of the Goths as well as Swedes. Frey-Yngve built a temple on the ruins of that at Sigtuna and called it Upsala ('high halls'), and founded the dynasty of the Ynglingar, which ruled in S. until the death of Juggald Ill-raada, who lost his life by vengeance for the burning alive of six Smaa-kongar. Ivar Vidfadme, ruler of Skaania in South S., was now chosen king. In the Icelandic sagas he is said to have conquered Denmark. The great victory of Bravalla gained by Sigurd Ring over the Danish King, Harald Hildetand, gave Denmark to Sigurd, whose son, Regner Lodbrog ('leather leggings'), is a favourite hero of the Scandinavian skalds. Bjorn Jernside, son of the latter, succeeded to S., which was long ruled by his descendants, most famous of whom was Erik Sejrsoel ('Victorious'), who died in 993. His son, Olaf Skötkonning ('Lap-King'), who ruled from 993 to 1024, was the first Christian king of S., and was baptized probably about 1000. The line having died out in 1056, disputes as to the succession arose between the Svea and Göta, but the former were able to set up Stenkil Jarl, of Vestergötland, a Christian, who reigned until 1066. For nearly a century after his death S. was torn by factions and religious wars, while Christianity went backward, until, in 1135, Sverker Karlsson mounted the throne. After a reign of twenty years he was succeeded by his

cousin, Erik Jedvardsson, surnamed 'the Saint,' who belonged, through his father, to the Bondar or peasant class. He was the first to erect a church at Upsala, and to enact a general code of laws. He was killed in battle by Magnus Henriksen in 1160, and for nearly a century disorder and misery reigned in the land from the struggles for the crown between his descendants and those of Sverker. In 1222 the last of the Sverker race died out, and Erik Läspe mounted the throne. With him ended in 1250 the Bondar line. He was followed by his nephew Valdemar, of the Folkungar family, who was dethroned in 1276 by his brother Magnus. The latter was followed in 1290 by his son Birger, who was deposed in 1319 in favour of his nephew Magnus Smek, who in turn was deposed by the Diet in 1343, his son Erik being substituted. On the death of Erik in 1359 Magnus was reinstated upon the throne, but he was finally deposed in 1363, and succeeded by his sister's son, Albrecht of Mecklenburg. Albrecht, however, was as unpopular as his predecessor, and accordingly the throne was offered to Margrete (q. v.), Queen of Norway and Denmark, who formed the three realms into a confederate monarchy by the Union of Kalmar in 1397. She was followed in 1413 by her grand-nephew, Erik of Pommern, but his tyranny greatly irritated the Swedes, who expelled the Danes in 1433. The next ninety years were occupied by the struggles of successive Danish kings to establish their hold on S. The last Danish king of S. was Christiern II., who, aided by the Primate Trolle, put down the patriotic party under Sten Sture, and massacred in the great market-place at Stockholm, November 8, 1520, ninety-four prelates and nobles. 'The Union of Kalmar was drowned in the blood bath' of Stockholm, for the Swedes flew to arms under Gustaf Erikson Vasa, son of one of the victims, and drove out the Danes, crowning their leader King Gustaf I. (q. v.) in 1523. The Lutheran doctrines had been introduced in 1519 by Olaus Petri, and had found a congenial soil in S. The Lutheran doctrines were adopted by the nation at the Diet of Vesteraas in 1527. Gustaf was succeeded by his son, Erik XIV., who was deposed in favour of his brother Johan in 1568, whose efforts to restore Catholicism were imitated by his son Sigismund, who succeeded in 1592, having been elected King of Poland in 1587. In 1593 the Augsburg Confession was adopted as the national creed. After a stormy reign of eight years Sigismund was deposed, and the crown of S. given to his uncle, Karl IX. (q. v.). This led to the Polish War of Succession (q. v.), which smouldered on until 1660. Karl was succeeded by his son, Gustaf II. Adolf (q. v.), the most famous king of his times. At the close of the great eighteen years' struggle, in which S. won so much glory, her gains from the war were the possession of Western Pommern, Rugen, Stettin, Weimar, and Bremen, and the promise of five million rix-dollars. Gustaf was followed by his eccentric daughter Christina (q. v.), who abdicated in 1654, and was succeeded by her cousin, the warlike Karl X. (q. v.), who filled the throne until 1660. Under his son, Karl XI. (q. v.), a long peace gave S. time to recover from her prostration, and the royal power was gradually augmented at the expense of that of the nobility. Karl XII. (q. v.) succeeded his father in 1697. At his death in 1718 the crown fell to his sister, Ulrika, who in 1720 resigned it to her husband, Prince Friedrich of Hessen. His long reign was a period of humiliation, yet the people found means to deprive the weak monarch of his absolute power, and at the Diet of 1720 obtained a 'royal assurance' of constitutional government. Disastrous intrigues rent the court, the two principal parties being the *Hattar* ('hats') or French party, and the *Natmössor* ('night-caps') or Russian party. The temporary power of the former led to the fatal war with Russia in 1741, by which S. was stripped of E. Finland. Adolf Fredrik of Holstein-Gottorp was followed in 1771 by his son Gustaf III. (q. v.), who destroyed the factions of the nobles and recovered much of the power of the crown. He was assassinated in 1792, and followed by his son Gustaf IV. (q. v.), who was succeeded in 1809 by his uncle, Karl XIII. (q. v.). The war with Russia was closed (1809) with the loss of Finland, E. Bothnia, and Aland. In 1810, on the election of a Crown-Prince, the choice of the Estates fell on Bernadotte, Prince of Ponté-Corvo, who mounted the throne as Karl XIV. (q. v.). In 1814 the crown of Norway was united with that of S. Karl XIV. died in 1844, and was succeeded by his son Oscar I. (q. v.), followed in 1859 by his son Oscar II. (q. v.), who on his death in 1872 left the crown to his brother Oscar III. (q. v.), the present king. The long peace that S. has now enjoyed has greatly developed her trade and increased her prosperity, and the liberal policy of the government has saved the country from discontent. In 1866 a Reform Bill was passed, and in February 1870 were removed the civil disabilities of dissidents and Jews. A new reorganisation of the fleet began in 1875; but from 1867 to 1877 repeated bills for army extension have been thrown out by the strong majority of the cheese-paring 'Landmann Party' in the Lower House. See Törnebohm, *Geographie der Schwedischen Hochgebirge* (Stock. 1873); *Illustreradt Sverige* (ib. 1875); *Statistik Tidskrift* (ib. 1877); and for the history, Fryxell, *Berättelser ur Svenska Historien* (40 vols. 1823-71); E. G. Geijer, *Svenska folkets Historia*, vols. i.-iii. (new ed. Stock. 1876), continued by Carlson, vols. iv. and v. (1855-75); and *Sveriges Historia fran äldsta til vara Lagar* (1876 *et seq.*) by Montelius, Hildebrand, Alind, and others.

Swe'denborg, Emanuel, was born at Stockholm on the 29th January 1688. His father was Dr. Jesper Swedberg, afterwards Bishop of Skara; his mother was Sara Behm, daughter of Albrecht Behm, Assessor of the Royal College of Mines in Sweden. S. was educated at the University of Upsala, and took his degree of Doctor in Philosophy in 1709. The next year he visited England and Holland, and returned after fifteen months' absence. His favourite studies at this time were mathematics and mechanics, by which he gained the good opinion of Charles the Twelfth, and was by him appointed Assessor of the Royal College of Mines in 1716. In 1719 the Swedberg family were ennobled by Queen Ulrica Eleonora, and their name changed to S. In 1721 S. went abroad a second time, and published in Holland some scientific pamphlets. The years from 1722 to 1733 he spent in active discharge of the duties of his office. Of his *Opera Philosophica et Mineralia* (3 vols. Dresden and Leipz. 1734), the first vol., the *Principia*, is a remarkable cosmogony. By the publication of this work S. gained a high reputation among men of science of the time, not only by its acute and comprehensive reasoning, but also by the foreshadowing of many scientific truths then unknown and afterwards brought to light and confirmed, when the scientific merits of the author were forgotten, and his name was commonly associated with visions and fantastic dreams. The years 1736-40 he spent in travelling through Europe from Sweden to Italy and back again. In 1740-45 he published his last scientific works, the *Economy of the Animal Kingdom* and the *Animal Kingdom*. The principal aim and scope of these was, according to the author himself, to obtain a true knowledge of the soul by a thorough examination of the anatomy and physiology of the human body. In this he was, of course, unsuccessful. But the time was at hand when another and surer way of attaining his object was to be opened to him.

In a letter written in 1769 S. gives the following account of this opening: 'I have been called to a holy office by the Lord himself, who most graciously manifested himself to me his servant in the year 1743, when he opened my sight to a view of the spiritual world, and granted me the privilege of conversing with spirits and angels, which I enjoy to this day. From that time I began to print and publish various arcana that have been seen by me or revealed to me, as respecting heaven and hell, the state of man after death, the true worship of God, the spiritual sense of the Word, with many other most important matters conducive to salvation and true wisdom.'

S. spent accordingly the remainder of his life in writing and publishing books on these subjects. He resigned his office, and began to study the Hebrew Bible. The first results of his illumination and study were the *Arcana Cœlestia* (1749-56), a spiritual interpretation of Genesis and Exodus, in eight quarto volumes. Then followed other works in quick succession, such as *Heaven and Hell* (1758), *On the Earths in our Solar System*, *On the New Jerusalem and its Heavenly Doctrine*, *Angelic Wisdom concerning the Divine Love and Divine Wisdom* (1763), *Angelic Wisdom concerning the Divine Providence* (1764), *The Apocalypse Revealed* (1766), *Conjugial Love and its Chaste Delights* (1768), and *The True Christian Religion* (1771). Besides, during twenty years, he kept minute notes of his intercourse with the spiritual world in what is called his *Spiritual Diary*, which was published after his death, as also several other works which he had left. S. wrote and published his books in Latin, but nearly all of them have been translated into English and many other languages. The latter part of his life S. spent partly in Sweden

and partly in England, and died in London, 20th March 1772. The most comprehensive of S.'s doctrines is the science of correspondences. The world and all natural things are produced from a spiritual origin; as the house is a visible production of the idea in the mind of the architect, so the visible universe is a material expression of the spiritual world. There is not a bit of stone, a blade of grass, an animal, or a particle in the human body, which does not express a spiritual principle, and would not have existed but for its spiritual counterpart or correspondent. This science of correspondences was, according to S., well known to the ancient world, but as the thoughts of man became more and more material this science was lost. It was S.'s principal mission to restore it to humanity. The Bible, or those portions of it which are inspired, is entirely written by correspondences, the only means of conveying spiritual truths to natural beings. Thus the first chapters of Genesis do not contain an account of the material creation of the universe, but of the spiritual creation by the Lord, or the regeneration of man, until all the evils of his nature are subdued, and he becomes an angel; the minutiæ of the Jewish worship are all expressive of spiritual ideas. The literal sense has therefore within it the spiritual sense, and both are united by correspondences, like soul and body.

The distinctive features of S.'s theology are—Jehovah God, the creator and preserver of heaven and earth, is one in essence as in person, in whom there is nevertheless a divine Trinity: the Father, the essential divinity; the Son, the divine humanity; and the Holy Spirit, the divine proceeding, answering to the soul, body, and operative energy in man. The Lord and Saviour Jesus Christ is this God. He took upon himself human nature in order to remove from man the powers of hell, by which man would necessarily have been conquered unless divinity itself had come to his assistance. Herein is the great work of redemption. Man receives life from the Lord, who is love itself and wisdom itself, but it is received differently by every one, according to his quality and power of reception. Even while in this world the spirit of man is, unknown to himself, either in heaven or in hell, and is acted upon by influences from both, and his free will consists in having the choice of lending himself to the influences of either. Man is born into evil with tendencies towards it; he must therefore be regenerated or created anew by the Lord, submitting of his own free will to the regenerating influx from the Lord; every one is capable of doing this according to his condition. His future state will therefore depend upon what use he has made of his choice, and what he has made his ruling affection in this life: if good, he will enter into the society of angels, that is, heaven; if bad, he will flee from their society and enter hell.

S. never separated himself from the Lutheran Church in which he was born, but his followers formed themselves into a Church called the 'New Jerusalem Church.' It has numerous societies both in Great Britain and America. S. has also a large number of readers and admirers, and, it is said, not a few disciples, in many of the Christian communions. There are biographies of S. by Garth Wilkinsor (1849), Paxton Hood (1854), and White (1867). Also Tafel's *Documents concerning S.* (Lond. 1875–77).

Swedish Language and Literature. *Language.*—The S. language is the modern literary representative of the Swedish dialects of the *dönsk tunga*, *norræna tunga*, or *norrænt mál*, once common to all Scandinavia (q. v.). Of this language are the Runes (q. v.) of over 2000 extant Scandinavian inscriptions, nine-tenths found in Sweden. These go back to the 9th c., belong mostly to the 11th and 12th, and come down even to the 14th. The earliest extant form of the S. language has these deviations from the old Scandinavian: (1) the diphthongs *ai*, *au*, *ey* are replaced by the single vowels *e*, *ö*; (2) *a*, with *u* (*v*) in the following syllable, by *ö*; (3) *h* is lost before *l*, *n*, and *r*; (4) *fn* is changed to *mn*; (5) *d* is inserted between *l* and *r* or *m* and *r*, as likewise *b* between *m* and *l* or *m* and *r*; (6) many inflections give place to separate words; and (7) for the reflexive form in *sk* (*-st*) appears a form in *s*, with a passive meaning. By the 16th c. *g*, *b*, and *d* tended to supersede *k*, *p*, and *t*, *þ* before *t* was changed to *f*, the German *ch* was adopted, substantives had lost all case-inflections save the genitive *s*, the Danish *e* was used in the infinitive, and the suffixes *-het*, *-inna*, *-nar*, *-eri*, and *-era*, and prefixes *be-*, *bi-*, *unt-*, *for-*, and *för-*, were in common use. In the 16th and 17th centuries, *k*, *p*, and *t* were replaced for *g*, *b*, and *d* within words, the Danish ending *e* was succeeded by *a*, many Latin, French, and especially German words and idioms were introduced, and the German prefixes *an-*, *här-*, and even *ge-* and *er-*, became general. By the beginning of the 18th c. the Swedish language, except in orthography, had essentially its present form. See DANISH LANGUAGE; Södervall, *Hufvudepokerna af Svenska Sprakets Utbildning* (Lund. 1870); Rydqvist, *Svenska Sprakets Lagar* (5 vols. Stockh. 1850–74); *Ordbok öfver Svenska Spraket* of the Swedish Academy (1870 *et seq.*), and its *Ordlista* (3d ed. 1875).

Literature.—The oldest extant Swedish writings are the *Landskapslagar* ('provincial laws'), especially those of Westgöta and of Upland (c. 1296), and the remarkable work of unknown authorship, *Um Styrilsi kununga ok Höfdinga* (14th c., critical ed. by Geete, 1878), which, save for St. Bridget's (q. v.) *Revelationes*, is the only production of Swedish mediæval speculation now extant. About the same time appeared the first Swedish translation of the Pentateuch, probably by Birgitta's father confessor, Canon Mattias of Linköping (*d.* 1350). Soon afterwards history had a weak beginning in the *Rimkrönikor*, of which the chief are the *Gamla* or *Erikskrönikan* (1320), the *Nya* or *Karlskrönikan* (1452), and the *Sturekronikar* (1496), from which the Latin history of Ericus Olai, *Cronica regnum Gothorumque* (1615), is mainly translated. Noteworthy also are the versified romances translated (1303–12) into Swedish by direction of the Norwegian queen Eufemia, *Herr Ivan Lejonriddaren*, *Hertig Fredrik af Normandie*, and *Flores och Blanzeflor*. The greatest poet of Sweden in the Middle Ages was Bishop Tomas of Strengnäs (*d.* 1443), author of poems *Om Engelbrekt*, *Om Friheten*, and *Öfver Erik Puke*. Of the Swedish *Folkvisor* only a small number belong to the 'Catholic Period.'

Under the rule of Sten Sture the Elder printing was introduced into Sweden, and a university was founded at Upsala (1477). But even more important was the Reformation, and the freedom it gave to intellectual life. The Reformers did great service to the literature by their hymns and histories, but most of all by their translation of the Bible (Upsala, 1540–41), which, though marred by Germanisms, helped greatly to develop Swedish prose. Olaus Petri's *Tobie Comedia* (1550), the first Swedish drama, served as a model to many imitators. Almost contemporary with these appeared the Latin histories of Johannes and Olaus Magnius (q. v.), and the useful though uncritical *Scondia Illustrata* of Messenius (*d.* 1636). All the first rulers of the Vasa dynasty favoured science, but it was the munificence of Gustaf II. Adolf to the University of Upsala, with the closer contact with the rest of Europe that his policy occasioned, that gave the rein and spur to a national interest in literature. The entrance of foreign culture did not promote writing in the mother tongue, and the language of the learned continued to be Latin. Therefore this period is poor in great productions, if indeed these were possible in an age when intolerant theologians persecuted all originality as heresy, and philosophic study was fast bound by scholasticism that knew not yet of the free spirit of Cartesian doctrine. Save in the important *Bibelvärk* (1711–28; new ed. 1863–65) of the two Gezelii, theology was productive only of homiletical works. The rude state of the language was an offence to song, yet it was now that 'the muses first learned to speak the Swedish tongue' in Stjernhelm's verse, which was successfully imitated by 'Lucidor' (*d.* 1674) and Runius (*d.* 1713), as licentious in their poetry as in their life. Stjernhelm (*d.* 1672) would better have deserved the name of 'father of Swedish poetry' had he not wasted his energies on too various fields. This also was the fault of Rudbeck (*d.* 1702), who obscured his merits as a writer on medicine and botany by the adventurous antiquarian hypotheses he aired in his *Atland eller Manheim* (1679 *et seq.*), a work by which the whole course of historical inquiry was perverted for many decades till it was at length restored by Dalin (1708–1763). Before his time Girs (*d.* 1639) and Tegel (*d.* 1636) had written Swedish history under the Vasa kings. The so-called 'Period of Freedom' that began with the death of Karl XII. was not deficient in scientific works, but it was not till the age of Gustaf III. that literature first reached a great development. The 18th c. gave impulse chiefly to the natural sciences, yet the rest were not neglected, as show the names of Rydelius (*d.* 1738) in philosophy, Ehrenstrale and Calonius in jurisprudence, Rosén von Rosenstein, Palmblad, and Murray in medicine, and Nohrborg (*d.* 1767) in theology. As a botanist, Linné (q. v.) gained world-wide fame, and found able disciples in Sparrmann, Thunberg, and Löfling. In chemistry and mineralogy the chief were Vallerius, Bergman, Gahn, and,

above all, Scheele (q. v.). History was written by Dalin, Lagerbring (*d.* 1787), and Hallenberg (*d.* 1834); and poetry was cultivated with success by Dalin, Fru Nordenflycht (*d.* 1763), Creutz (*d.* 1785), and other members of the Societies *Tankebyggare-orden* and *Utile Dulci.* Under Gustaf III., who by the foundation of the Swedish Academy made a new epoch in the history of the literature, appeared Kellgren (*d.* 1795), equally distinguished as a critic and poet, and Bellmann (q. v.), who freed himself wholly from the bonds of French tradition that bound Gyllenborg (*d.* 1808), Oxenstjerna (*d.* 1818), and Leopold (*d.* 1829). An interesting feature of this period are Fru Lenngren's (*d.* 1817) miniature pictures of the ridiculous in everyday life. An eager declaimer against the prevailing taste was Thorild (*d.* 1808), who fancied himself equally a political, social, and literary reformer, and in 1810 a regularly organised struggle began in the starting of two new periodicals, Askelöf's *Polyfem* and Atterbom's *Phosphorus,* in opposition to the classical organ, Wallmark's *Journal för Litteraturen och Theatern.*

The leading members of the 'New School,' generally named the 'Phosphorister,' were Hammarskjöld (*d.* 1827), Dahlgren (*d.* 1844), Livijn (*d.* 1844), Palmblad (*d.* 1852), and Atterbom (*d.* 1855). It is a common remark that the influence of the Phosphorister on the Swedish literature was negative rather than positive. Before them Franzén (q. v.) and Wallin (q. v.) had begun to turn the course of poetry into a deeper channel, without directly combating the prevailing tendency, and side by side with them rose the 'Göthiska Forbund,' led by Tegnér (q. v.), Geijer (q. v.), and Ling (*d.* 1839), who held a neutral course, laying stress on the significance of a national feeling in literature, and confining their poetry and history to Swedish life and scenery. At length the two schools began to lose their individuality in the subsidence of their strife, from which many of the most gifted poets had kept wholly aloof. Not only was this the case with Franzén and Wallin, but also with Stagnelius (*d.* 1823), whose excellence in almost every branch of the poetic art is marred by his passion for abstract subjects. Another poet, eminent alike as a lyrist and a satirist, was Sjöberg ('Vitalis') (*d.* 1828), whose originality went far beyond his friend Nicander (*d.* 1839), the 'poet of perfect form.' The choicest products of the more recent Swedish literature are the works of Runeberg (q. v.). Of the other Swedish poets that have died in the two last decades, the greatest names are Silfverstolpe (*d.* 1853), Von Braun (*d.* 1860), Fahlcrantz (*d.* 1866), Von Beskow (*d.* 1868), Sturzen-Becker (*d.* 1869), Grafstrom (*d.* 1870), and Strandberg (*d.* 1877). Of living poets, Böttiger, Sätherberg, Nybom, Topelius, and Snoilsky are the chief. Von Beskow and Borjesson (*d.* 1866) have written excellent tragedies; Stagnelius, Almqvist (*d.* 1866), and Nicander dramatic poems unsuited for the stage; and comedy has been successfully cultivated by Blanche (*d.* 1868), Hodell (*b.* 1840), and Jolin (*b.* 1818).

The first Swedish novel, *Adalriks och Gjöthilda's äfventyr,* was published by Mörk in 1742-45. Not till the 19th c. did he find successors in Livijn and Cederborgh (*d.* 1835). The historical novel of Scott has been imitated by Gumælius, Palmblad, Sparre, Kullberg, Mellin, Ridderstad, Topelius, Starbäck, Rydberg, Crusenstolpe, and Almqvist. The later fiction of Fredrika Bremer (q. v.), and the tales of Wetterbergh ('Onkel Adam') (*b.* 1804), are marred by excessive display of 'purpose.' Popular lady novelists are the Baroness Knorring (*d.* 1848), Fru Carlén (*b.* 1807), and Fru M. S. Schwartz (*b.* 1819). The greatest historian of Sweden is Geijer (q. v.). History has also been written by Fryxell (q. v.), Carlson (*b.* 1811), Styffe (*b.* 1817), K. G. Malmström (*b.* 1822), Tengberg (*b.* 1832), and Odhner (*b.* 1836); and the history of literature by Wieselgren (*b.* 1800), Atterbom, Böttiger, B. E. Malmström (*d.* 1865), and Ljunggren (*b.* 1825), Dalin (*d.* 1873), Säve (*d.* 1876), and Rydqvist (*d.* 1877), are names distinguished in Scandinavian philology, as are Lindfors, Torneros, Palmblad, and Cavallin in classical study, and Norberg, Tullberg, and Tornberg (*d.* 1877) in Oriental learning. Of scientific writers in the 19th c., the greatest are Berzelius (q. v.) in chemistry, Fries (q. v.) in botany, Stal (*d.* 1878) in entomology, and in physics, Berzelius, Rudberg, Wrede, Theorell, Hyll, Edlund, Angström, and Thalén. The chief literary periodicals of Sweden are *Svensk Tidskrift för politik, ekonomi, och literatur* (Lund. 1866 *et seq.*), *Framtiden* (Stock. 1868-71, and 1876 *et seq.*), and *Tidskrift för hemmet* (*ib.* 1859 *et seq.*). See Wieselgren, *Sveriges Sköna Literatur* (5 vols. Stockh. 1843-49), B. E. Malmström, *Grunddragen af Svenska Vitterhetens Historia* (5 vols. 1866-68), Klemming, *Sveriges Dramatiska Literatur* till 1863-70), Ljunggren, *Svenska Dramat Intill Slutet af Sjuttonde Arhundradet* (1864), and *Svenska Vitterhetens Häfder Efter Gustaf III.'s Död* (vol. i. 1873; vol. ii. 1875-77; vol. iii. part i. 1878), and Claëson, *Öfversigt af Svenska Sprakets och Literaturens Historia* (4th ed., 1878).

Sweet-Briar. See ROSE.

Sweet'meats comprise all ordinary articles of confectionery, as well as many of the lighter fancy *confitures* prepared by the pastry baker.—*Sweets,* an indefinite term sometimes applied to British wines, and sometimes to articles of fancy confectionery.

Sweet-Pea'. See LATHYRUS.

Sweet-Pota'to. See BATATAS.

Sweet'-Sop (*Anona squamosa*), a large shrub or tree of stunted irregular growth with spreading branches, indigenous in the W. Indies and much cultivated in other tropical countries. It is completely domesticated over a great part of India. The fruit is about the size of an orange, of a glaucous yellowish-green colour, covered with projecting scales; pulp white with a tinge of yellow, very sweet. The acrid seeds and the leaves are an insecticide. See ANONA and CUSTARD-APPLE.

Sweet-Will'iam. See PINK.

Sweet'-wood, a name locally applied to the timber of 10 or 12 different trees of various genera. S.-W. bark is a spurious cascarilla bark from *Croton Eluteria.* See CASCARILLA and CROTON.

Swell, in music, a gradual increase usually followed by a corresponding diminution of tone. In the organ, a certain number of pipes with a key-board arranged so that the intensity of their sounds may be augmented by the action of a pedal.

Swiete'nia. See MAHOGANY.

Swift (*Cypselus*), a genus of *Fissirostral* birds, closely allied to the Swallow (q. v.), and included in the Swallow family (*Hirundidæ*). The wings are relatively long and curved. The tail is forked. The toes are strong, and the hinder toe is turned forwards. In their internal anatomy, the swifts bear a close resemblance to the humming-birds, and there is little doubt that these apparently dissimilar groups have had a common ancestor. The common S. (*C. apus*) attains a length of 6 or 7 inches, and is of a sooty black colour, with a white patch beneath the chin. Its flight is sharp and quick. The nest is built in holes in rocks and in walls, and the eggs are of a white colour. The S. leaves Britain at the end of August. The white-bellied S. (*C. melba*), also known as the Alpine S., is a second species. The N. American chimney S. is the *Acanthylis pelagia* of ornithologists. Swifts and swallows, nearly allied as they are in habits, very rarely inhabit the same localities.

Swift, Jonathan, was born in Dublin, 30th November 1667, a day that he ever kept as one of mourning. His father, a feeless lawyer come of a Yorkshire family, had died seven months before; and S. at the age of six was sent by an uncle to Kilkenny school. In 1682 he entered as pensioner Trinity College, took a creditable B.A. (1685), and three years later was driven from Dublin by Tyrconnel's outbreak. He found his way to his mother's Leicester home, and in 1689 became private secretary to Sir William Temple, his mother's connection by marriage. At Moor Park S. was initiated into Whig politics, and quickly developed such statesmanlike abilities that Temple once sent him to argue with William III. in favour of the Triennial Bill; there too he found Esther Johnson, a child of seven, the 'Stella' of after years. His taking orders (1694) led to a passing quarrel with his patron, but after two years of absence he returned from the Irish prebend of Kilroot to Surrey, there to remain till Temple's death (1699). During this second sojourn he wrote the *Battle of the Books,* a burlesque on Sir William's opponents in the Ancient *v.* Modern controversy, also the Rabelaisian *Tale of a Tub* (1704), proclaiming war in it against half Christendom. Having edited Temple's posthumous works, S. went to Dublin as chaplain and secretary to Lord Justice Berkeley, but, superseded in the latter post, and disappointed of the deanery of Derry, accepted discontentedly the living of Laracor, Meath, and in 1701 invited to Ireland Stella, and Mrs. Dingley her dear friend. During S.'s absence they occupied his vicarage or Dublin residence, which on his return they quitted for lodgings of their own, an arrangement that lasted through seven-and-twenty years. And scandal, if scandal there

were, blew quickly over, since in 1703 the Rev. W. Tisdell, S.'s old acquaintance, made Stella an offer of his hand. With a congregation of but half a score, S. easily visited London once a year, and though the *Tale of a Tub* blasted his chances of preferment with the Queen, it did him honour with Addison, Steele, and the other Whig wits forming the little senate of Will's. His intimacy with them, dating from 1705, continued close and convivial till his adhesion to the new Tory ministry (1710), an adhesion prompted in part by personal pique, but also by his aversion to the belligerent Whig policy and his obtaining from Harley the remission of 'first-fruits' which Godolphin had denied. Whatever his motives, a Tory S. became, and by his *Examiner* (1710–11), *Conduct of the Allies* (1712), and such like pamphlets, inflicted on Marlborough his first defeat, prepared the way for the Treaty of Utrecht, and earned for himself St. Patrick's deanery (1713). During this period he also penned the wonderful *Journal to Stella*, 'which has,' says Forster, 'no parallel in literature for the historic importance of the men and events that move along its pages,' whose 'little language' expresses a loving playfulness dating from Stella's childhood. But in this *Journal* are faint allusions to the rival Esther—'Vanessa,' or Miss Vanhomrigh, the orphan daughter of a rich Dutch merchant, S.'s pupil and blind worshipper. Her fruitless court to him is described in *Cadenus* (decanus) *and Vanessa*, S.'s finest poem; and when on Anne's death and the consequent Tory downfall he withdrew to Ireland, she followed him. As least of two evils, he is said to have privately married Stella (1716); the news of this marriage reaching Vanessa, from whom up to 1720 S. held aloof, killed her (1722); and Stella herself died 28th January 1728, described as a 'spinster' in her will, while Forster sees no evidence for any marriage. Meantime, as patriot, S. by the *Drapier Letters*, denouncing Wood's patent for a copper coinage, impeached the Government and became Ireland's idol; next, as misanthrope, in *Gulliver's Travels* (1726) indicted mankind itself, and was rewarded by the world's applause. Men's virtues here are looked at through an inverted telescope, their vices placed beneath a microscope; men to the cynical Dean at last seem lower than the brutes, human Yahoos than equine Houyhnhnms. Not seldom caricatures delight the caricatured, and S. on his two last visits to London (1726–27) found himself fêted by Arbuthnot, Pope, and Gay; but the sighed-for mitre never got further than Hounslow Heath, and its would-be wearer was doomed to learn how near a man may come to a Yahoo. 'Deaf, miserable, and full of pain,' he passed five years guarded by keepers, and died in Dublin, 19th October 1745. His Complete Works, edited by Scott (19 vols. 1815), contain the gravely-ironical *Arguments against the Abolition of Christianity*, the serious *Advancement of Religion* (S.'s only acknowledged work), *Thoughts on Religion* ('a series of excuses for not professing disbelief,' as Thackeray styles them), the incomparable *Directions to Servants*, the gruesome *Modest Proposal* (viz., to keep down the Irish population by eating Irish babies), &c. Of the poems may be noticed *Baucis and Philemon* (as altered by Addison), the *City Shower*, and *Hamilton's Bawn*. See the unfinished Life of S. by Forster (vol. i. Lond. 1875), which reaches only to 1711; the Lives by Johnson, Scott, Wilde, &c.; and Thackeray's *English Humourists* (Lond. 1858).

Swill'y, Lough, a sea-loch and brook on the N. coast of County Donegal, Ireland. The lough is about 1½ miles in average breadth; it extends N. and S. for 24 miles, and forms a safe and commodious harbour. The stream, about 15 miles long, discharges a considerable volume of water into L. S.

Swimm'ing, the art of propelling one's self through water by motions of the arms and legs, is a highly useful art and a gymnastic exercise of the first order. It is remarkable that S. as a branch of physical education has hitherto been so neglected, and its utility ignored even by maritime communities. It is a well-known fact that among seafaring men the proportion of expert swimmers is exceedingly small. The sense has, however, been awakened of the need for a general cultivation of the art, and in most large cities S.-baths have been established where S. may be practised and professional instruction obtained if desired. Moreover, S. has been introduced as a feature of physical training in some public schools. Keeping in view the fact that the human body has a less specific gravity than that of water, the art may be easily acquired with confidence and self-command, and attention to a few simple rules which are fully laid down in many cheap manuals. There are numerous mechanical aids to the teaching of S. in the form of cork-floats, cork-jackets, and many inflated india-rubber contrivances. In midsummer 1875 Captain Boyton paddled himself, clad in a dress of the latter description, across the English Channel from Cape Grisnez to S. Foreland; but the most wonderful S. feat on record is that of Captain Webb, British Mercantile Marine, who in August 1875 swam from Dover to Calais without artificial floats. The distance as the crow flies is 22½ miles, but owing to tides and currents the course traversed by Webb was at least 15 miles longer, and the time occupied was 21¾ hours. Two years later a similar feat was accomplished by Mr. Cavill in 12 hours, Cape Grisnez and S. Foreland being the points of departure and landing.

Swin'burne, Algernon Charles, one of the greatest English poets of the 19th c., is the son of Admiral S. and of Lady Jane Henrietta, daughter of the Earl of Ashburnham. He was born in London April 5, 1837, entered Balliol College, Oxford, in 1857, but did not remain long enough to take his degree, though his poems show that he has both the spirit and the culture of a scholar. On leaving the university S. visited the Continent, and in Italy became intimate with Landor (q. v.), for whose genius he still entertains an almost idolatrous veneration. His first works were two plays, *The Queen Mother* and *Rosamond*, both published in 1861, but neither of which attracted much notice. The splendour of his genius first blazed out in his *Atalanta in Calydon* (1864), a tragedy framed on the Greek model, and worthy to be ranked with the masterpieces of antiquity. The passionate delight in sensuous life, the pathetic yet noble resignation to the despotism of fate, and the strange reverence for gods that are either helpless or harsh, which mark the Hellenic creed, were set forth with a subtlety, strength, and freshness of imagination, a simplicity and grace of words, a full-flowing, swift-changing melody of verse that announced infallibly the advent of an original poet of the first order. Since then S. has written *Chastelard, a Tragedy* (1865), *Poems and Ballads* (1866), a volume which has given rise to the fiercest strife in contemporary criticism, *A Song of Italy* (1867), *Siena, a Poem* (1868), *Ode on the Proclamation of the French Republic, September 4, 1870*, *Songs Before Sunrise* (1871), *Bothwell, a Tragedy* (1874), *Erechtheus* (1875), another drama on the Greek model, and a second series of *Poems and Ballads* (1878). Besides these he has published several prose works, *Notes on Poems and Reviews* (1867), a defence of his art and his ethics against the strictures of critics; *William Blake, A Critical Essay* (1867); *Notes on the Royal Academy Exhibition* (1868), in conjunction with W. M. Rossetti; *Essays and Studies* (1875), and *A Note on Charlotte Bronte* (1877). The superb qualities that first revealed themselves in the *Atalanta* are present even in greater richness in S.'s later works. His genius burns with a hotter flame, but it sends forth brighter and more dazzling lights. His power of dramatic expression becomes more intense and direct, his perception of character more subtle and far-reaching, his lyric ardour more irresistible and magical, but there is also a wilder licence and revelry of imagination. In *Chastelard and Bothwell* we are conscious of a fatal decline from the tone of *Atalanta*. The fault is no doubt partly due to the *dramatis personæ*, who contrast miserably enough with the pure and majestic figures of legendary Greece, but the poet seems to joyously surrender his own soul to the Circean sorceries of his muse, and his highest raptures are reserved for the celebration of visionary lusts. Through the *Poems and Ballads*, many of which are miracles of music and beauty, there runs a shuddering sympathy with sin. He loves to dream of unpermitted delights, and his mouth is full of their praise; yet he knows and proclaims in every variety of verse that their end is grief and shame. When this unhealthy mood has passed away, we may fairly hope that so great a master will return to work in which the nation can feel an unalloyed pleasure.

Swind'ling, a popular term used to denote fraudulent procedure—especially when the deception is gross and the rascality marked. See FRAUD.

Swin'don, a market-town of Wiltshire, 77¼ miles W. of London by rail, has a parish church, designed by the late Sir G. G. Scott (1847), with a lofty spire, four chapels, good schools (1871), a town-hall (1852), corn-exchange (1867), and assembly rooms (1850). There are large oolite quarries, but no manufactures,

S. publishes two weekly newspapers. Pop. (1871) 4092.—**New S.**, 1½ miles N. of the old town, contains the junction station of the Great Western Railway, one of the largest in the kingdom, as also the Company's engineering works, which cover 82 acres, employ 5400 men, and in the first six months of 1878 turned out 16 engines. The chief buildings are the church of St. Mark (1845; enlarged 1876), a Roman Catholic and four other chapels, schools (erected by the Company, 1873), and a mechanics' institute (1843), with a library of 6000 vols. New S. publishes one weekly newspaper, and has large sewing and milk and cheese factories. Pop. (1871) 7628.

Swin'emünde, a fortified seaport of Pommern, Prussia, on the island of Usedom, 1½ miles from the mouth of the Swine, one of the three channels by which the Oder (q. v.) empties itself into the Baltic. It is 43 miles from Stettin by water, and 68¾ miles by rail. Founded in 1740, S. owes its importance to its being the port for the heavier vessels trading with Stettin. It has also become a favourite watering-place. At the mouth of the Swine are two massive breakwaters ¾ of a mile in length, forming the entrance to the harbour. On the E. bank are new docks, and a lighthouse 210 feet high. S. has no export trade. In 1877 the imports were:—from Great Britain, coal, 251,212 tons; beer and spirits, 492 gallons; from other countries, wine and spirits, 26,863 gallons; chalk, 11,251 tons; timber, 8905 tons; corn, 6261 quarters; and herrings, 5207 barrels. In the same year there entered the harbour 2908 vessels of 702,926 tons, of which 1439 of 273,846 tons were German, and 699 of 311,548 tons were British, the latter being 50·39 per cent. more than in 1876, and 108·25 more than the average of the ten preceding years. Pop. (1875) 7977.

Swith'in, St., Bishop of Winchester from 852 till his death on July 2, 862, was at his own request buried in Winchester churchyard, 'where passers-by might tread above his head, and the dews of heaven fall on his grave.' On his canonisation a century later, the chapter resolved to translate his relics to a stately shrine within the cathedral, but were hindered from their purpose by a rain that, commencing on July 15, stayed not for forty days. Out of this legend arose the popular notion that a wet St. S.'s Day will be followed by forty days of rain, the feast of St. Gervais (19th June) being marked in France by a similar superstition.

Switz'erland (Ger. *Schweiz*, Fr. *Suisse*, Ital. *Svizzera*), an inland country of Europe, situated between 45° 48′ and 47° 49′ N. lat. and 5° 55′ and 10° 30′ E. long., and bounded N. by Wurtemberg, Baden, and Elsass, W. by France, S. by Savoy, Piedmont, and Lombardy, and E. by the Tyrol. Its greatest length from E. to W. is 180 miles, and its greatest breadth from N. to S. 130 miles. Area, 15,976 sq. miles; pop. (1876) 2,759,854. The following table shows the area and population of the cantons into which S. is divided—

Cantons.		Area in sq. miles.	Pop. July 1, 1877.
1. Aargau		542	202,048
2. Appenzell	Ausser-Rhoden	100	48,907
	Inner-Rhoden	61	11,906
3. Basel	Stadt	14	52,191
	Landschaft	162	55,802
4. Bern		2659	537,632
5. Freiburg		644	114,509
6. St. Gall		779	197,872
7. Geneva (Ger. *Genf*)		107	100,443
8. Glarus		266	36,362
9. Grisons (Ger. *Graubünden*)		2773	93,106
10. Lucerne (Ger. *Lüzern*)		579	133,490
11. Neuchâtel (Ger. *Neuenburg*)		311	103,832
12. Schaffhausen		113	39,140
13. Schwyz		350	49,485
14. Soleure (Ger. *Solothurn*)		302	78,355
15. Ticino (Ger. *Tessin*)		1087	122,152
16. Thurgau		379	95,390
17. Unterwalden	ob. dem Wald	183	15,114
	ned. dem Wald	112	12,045
18 Uri		415	17,041
19. Vaud (Ger. *Waadt*)		1244	244,352
20. Valais (Ger. *Wallis*)		2025	101,131
21. Zug		92	21,915
22. Zürich		665	296,815
Total		15,976	2,776,035

Physical Features.—The physical features of S. are very remarkable, affording greater contrasts than those of any other country in Europe, offering to the eye within an area ¼ that of England sublime snow-capped mountains and glaciers alternating with the most beautiful valley, river, lake, and woodland scenery. Two groups of mountains cover a great part of its surface, the Jura on the W. and N.W. and the Alps on the S.E. and centre. Thus the whole surface divides itself into three physical regions—the narrow belt of the Jura occupying 12·3 per cent. of the whole, the broad belt of the Alps covering 57·5 per cent., and the hilly plateau which separates them and forms 30·18 per cent. of the whole surface. The Jura is made up of six parallel ridges lying S.W. and N.E., and extending from Geneva along the boundary between France and the Pays de Vaud, through Neuchâtel, Soleure, and Aargau to Schaffhausen (see JURA). The Swiss Alps radiate from a central nucleus near the Grimsell Pass, two parallel chains running S.W. to the Lake of Geneva and Savoy, the northern known as the Bernese Alps, the southern as the Pennine Range; and two running E. to the Tyrol, and enclosing within them the sources of the Rhine and the Inn. The southern of these, which is really a continuation of the Pennine, is successively known as the Helvetian or Lepontine range and the Rhaetian or Grisons range (see ALPS). The area covered by glaciers is estimated at 900 sq. miles. They extend from Mont Blanc to the Ortler, and are 540 in number. To the Grisons belong 225, to Bern 155, and Valais 130. The largest glacier mass is the Bernina, the longest the Aletsch glacier, 15 miles in length. The great table-land of S. is its most fertile and productive region. With an average elevation of 1400 feet, it slopes from S. to N., from the base of the Alps to the Rhine and the Bodensee, including the cantons of Vaud and Freiburg, the greater part of Bern, Lucerne, and Aargau, and the whole of Zurich, Zug, Thurgau. The river system of S. corresponds with the peculiar physical character of the country. The chief watershed is the St. Gothard, in the Lepontine Alps, from which flow to the S.W. the Rhone, N.E. the Rhine, to the N. the Aar and the Reuss, to the S. the Ticino and Tosa. From the Rhaetian Alps flow the Inn N.E. to the Danube, and the Adige S.W. through Lago di Como to the Po. Most of the rivers are very rapid, and pass in their courses through deep lakes. The largest of these are the Lake of Geneva, Bodensee or Constance (q. v.), and the Lake of Neuchâtel (q. v.).

Climate, Botany, and Agriculture.—From the physical constitution of S., its climate is necessarily very varied. The part S. of the central Alpine chain enjoys the most favourable climate. At the N. end of Lago Maggiore, the average temperature is 55° F., the long summer and short winter allowing the cultivation of the fig, almond, pomegranate, and orange. Equally fortunate are the S. part of Valais and the N. banks of the Lake of Geneva. The average temperature of the plateau is 46°-48° F., rising as we travel from the Alps, and reaching its maximum in the N.E. The rainfall amounts at Basel to 25 inches, at Bern to 46, at Zürich and at Neuchâtel to 33. The prevailing winds are a warm and rainy wind from the S.W.; a cold and dry from the N.E.; and a peculiar warm wind, experienced chiefly in the E. part of S., from the S. across the Alps, called the *Foen*. The vegetation of S. is divided into five zones, from the lowest valleys to the limit of perpetual snow. These are—(1) The lower region, embracing the central plateau, the great agricultural region, and the lower hills, from 700-2000 feet above the sea-level. Here are found deciduous trees, chiefly the chestnut, oak, and beech, while the cultivation includes all the ordinary European grains. (2) The region of the lower mountains, from 2000-4000 feet. The hardier deciduous trees, as the beech, ash, and maple, are found, and the cereals and hardier fruits are successfully cultivated. (3) The sub-Alpine region, from 4000-5500 feet on the N., and from 4000-6000 feet on the S. This is the region of conifers and of the rich grassy pastures of the Alps. (4) The Alpine region, from the limit of trees (6000 feet) to that of perpetual snow (9000 feet). The principal plants are the Alpine roses, reaching to 7000 feet, and the creeping azaleas, junipers, willows, and alders, besides the many species of delicate Alpine plants, many of which grow to 10,000 and 11,000 feet. The characteristic animals are the chamois, steinbock, the lämmergeyer, and the marmot. (5) The region of perpetual snow, which has its lowest limit in the Bernese Alps at 8800 feet, in the Grisons from 9200-9400 feet, on the S. slope of the Alps from 9000-9800 feet. In 1877 the

area under woods and forests was 1,905,407 acres; under all kinds of crops, fallow, and grass, 5,339,720 acres: while 75,335 acres were occupied by vineyards. In 1876 there were in S. 100,935 horses, 592,463 cows, 443,467 other kinds of cattle, 367,549 sheep and lambs, 334,515 pigs, and 396,055 goats (see ALPINE FARMING).

Industries, Commerce, &c.—S., though mainly an agricultural country, has extensive industries. At the census of 1870, 1,095,446 persons were supported either wholly or in part by agriculture, while 216,468 were employed in manufactories, and 241,425 in handicrafts. The principal manufactures are silk stuffs at Zürich, silk ribbons at Basel, watches and jewellery in the cantons of Neuchâtel, Geneva, Vaud, Bern, and Soleure, and embroidery and cottons in the cantons of St. Gall and Appenzell. Printing and dyeing are carried on in Glarus. The principal *exports* of S. are machinery, cheese, tobacco and cigars, cottons, manufactured silk, watches and jewellery, hides and wool; the principal *imports*, coal, grain, wine, sugar, salt, raw cotton, flour, oils, iron, coffee, and agricultural implements. In September 1878 S. had 1547 miles of railway, while in 1877 there were 4040 miles of telegraph lines belonging to the Federal Government. The number of telegraph messages sent in 1877 was 2,722,408, of which 1,950,546 were internal messages; the receipts were £79,418, and the expenses £79,150. In the same year the post-office forwarded 65,374,646 letters, of which 46,531,718 were inland letters; while the receipts amounted to £579,797, the expenditure to £557,775.

Government, Finance, Army, &c.—The republic of S., formerly a Staatenbund or league of semi-independent states, has been since 1848 a Bundesstaat or united confederacy. The constitution was revised in 1874, and as it now exists, vests the supreme legislative and executive power in the 'Bundes-Versammlung,' or Federal Assembly, which alone has the right to declare war, make peace, and conclude treaties with other powers, and which consists of two chambers, the 'Ständerath' or State-Council, and the 'Nationalrath' or National Council. The Ständerath consists of 44 members, two for each of the 22 cantons. The Nationalrath of 135 members, one for every 20,000 souls. General elections take place every three years, every citizen above twenty years having a vote, and every voter, not a clergyman, being eligible as a representative. The Bundes-Versammlung after each election nominates seven members for three years as a kind of cabinet, called the 'Bundesrath,' or Federal Council, in whom the chief executive authority rests, whose seven members act as ministers or heads of the seven administrative departments of the state, and whose president and vice-president, both elected for one year by the Bundes-Versammlung in a general meeting, are the first citizens of the republic. Disputes between the various cantons are settled by the 'Bundes-Gerecht,' or Federal Tribunal, which consists of eleven members, elected for six years by the Bundes-Versammlung, and is divided into the three sections, the 'Anklagekammer' (chamber of accusation), the 'Kriminalkammer' (the jury department), and the 'Cassations-Gerecht' (court of appeal), each consisting of three members, the remaining two members acting as president and vice-president. Its seat is at Lausanne, while the two chambers sit at Bern. Each canton has its local government, resting in a Grosse Rath chosen by universal suffrage, but in the cantons of Appenzell, Glarus, Unterwald, and Uri, all the male citizens of full age assemble at stated periods in the open air and exercise their powers directly in making their own laws. These assemblies are called 'Landesgemeinde.' The public revenue (mostly derived from customs) in 1877 was £1,631,570, and the expenditure £1,705,035. The public debt amounted at the end of 1876 to £1,104,000, but is balanced by property belonging to the state valued at £1,271,332. The Swiss army consists of the regular army, formed of men between the ages of twenty and thirty-two, and the Landwehr of those between thirty-three and forty-four years, and in 1878 had a total of 211,765 men, of whom 91,728 belongs to the Landwehr, and 119,982 to the regular army. The army expenditure in 1878 was £531,936.

Religion, Education, &c.—Of the population of S. 58·7 per cent. are Protestant, and 41 per cent. Roman Catholic. At the census of 1870 the number of Protestants was 1,566,347, Catholics 1,084,369, other Christian sects 11,435, Jews 6996. The Protestant church is Calvinistic and Presbyterian, the Roman Catholic is under the government of 5 bishops and upwards of 6000 regular and secular priests. Complete religious toleration is provided for by the constitution of 1874. Education is compulsory and widely diffused, especially in the N.E. cantons. In 1871-72 there were 5088 schools, 32 training-schools for teachers, 67 gymnasien, 41 real and industrial schools, a polytechnic school at Zürulha, a military academy at Thun, a fine-art school at Geneva, 3 academies at Geneva, Lausanne, and Freiburg, with 45 professors and 370 students, and 4 universities at Basel, Zürich, and Bern, which had, in 1877, 230 professors and teachers, and 974 students.

Inhabitants, Language, &c.—The population of S. is made up of three elements, the German, French, and Italian. German is spoken by three-fourths of the inhabitants, and is the official language of the country, but French is the principal language spoken in Geneva, Vaud, and Neuchâtel, and a part of Bern, Freiburg, and Valais. The inhabitants of Ticino and a part of the Grisons speak Italian, but in the sequestered valleys of the latter canton, two-thirds of the inhabitants speak Romaunsch and Ladin, peculiar old Latin dialects.

History.—The earliest-known inhabitants of S., supposed to have been Celts, were the Helvetii in the N.W., and the Rhaeti in the S.E. The former were conquered by the Romans, B.C. 58, the latter B.C. 15. Under the Roman rule, Eastern S. belonged to the province of Rhaetia, Western S. to that of Gaul. About the beginning of the 5th c., S. was overrun by the Alemanni, the Burgundians, and the Ostrogoths who became Christian about the end of the century, and were gradually subdued by the Franks. When the Franconian empire was divided among the sons of Hludwig the Pious in 848, the E. portion of S. fell to Hludwig the German, and was afterwards attached to the Duchy of Swabia, while the W. portion was joined to the Kingdom of Burgundy. On the death (1032) of Rudolf III., the last King of Burgundy, the greater part of S. passed to the Emperor Konrad II., whose successors granted it in fief to the Dukes of Zähringen, but after the death of the last duke in 1218, several parts were granted to other vassals, who waged continual warfare on one another, and harassed the country by their rapacity and extortion. The Swiss acknowledged their allegiance to the emperor, but brooked with difficulty the galling yoke of the imperial vassals. Many of the towns formed unions to protect their liberty, and Bern, Soleure, Basel, and Schaffhausen, obtained imperial charters, while the cantons of Uri, Schwyz, and Unterwalden placed themselves under the protection of Rudolf, Count of Hapsburg, in 1257, and Zürich in 1264. The 3 cantons of Uri, Schwyz, and Unterwalden, the Waldstätten or forest cantons, had not acknowledged the delegated authority of any of the imperial governors until 1209, when Otho IV., on his way to Italy, induced them to accept the Count of Hapsburg for their Landvoght or bailiff, the latter swearing at the same time to maintain their privileges. But they obtained from the Emperor Friedrich II. their liberty in 1231 and 1240 by a charter, in which the people of the three cantons are termed freemen, 'who owe no allegiance but to the emperor, by whom they are received with open arms, having submitted of their own free will to the empire, from which they shall not at any future time be detached or alienated.' This was confirmed by Rudolf on his election to the imperial throne, and at his death in 1291 the Forest Cantons formed their first league for mutual protection. Albrecht, reversing the policy of his father Rudolf, attempted to deprive the great towns of their privileges, but was obliged to retire from the walls of Bern and Zürich, while the people of the Waldstätten, goaded to desperation by the cruelty and pride of his ministers, took up arms to assert their independence. To this period belongs the doubtful stories of William Tell (q. v.), and of Stauffacher, Fürst, and Melchthal. After the murder of Albrecht by his nephew Johann of Swabia in 1308, his son Leopold continued the war, but was utterly defeated in the famous battle of Morgarten (1315), and subsequent Austrian attempts to recover the supremacy were frustrated by defeats at Sempach (1386), Näfels (1388), and at the Stoss (1405). In 1322 Lucerne joined the confederacy of the Forest Cantons, in 1351 Zürich, in 1352 Glarus and Zug, and in 1353 Bern. In 1415 the Swiss wrested Aargau and Thurgau from the Austrians, and inflicted severe defeats on Charles the Bold, Duke of Burgundy, the greatest captain of his age, at Granson (1476), Morat (1476), and Nancy (1477). In 1499 the Swiss victory over 15,000 Austrians at Dornach put an end to the Swabian war. This was the last of the series

of glorious victories by which Swiss independence was so bravely won. Meanwhile Freiburg and Soleure had joined the confederation in 1481, in 1501 Basel and Schaffhausen, and in 1513 Appenzell, thus completing the thirteen cantons, which existed until 1798. Geneva, Neuchâtel, Valais, and the Grisons were allies without a vote. In 1523 Zürich adopted the doctrines of the Reformation under the influence of Zwingli (q.v.), and was followed by Basel, Schaffhausen, and Bern, while the Forest Cantons remained firmly attached to the Church of Rome. In 1531 war broke out between the adherents of the two faiths, and the Protestants were defeated at Cappel, where Zwingli was slain. A second religious war broke out in 1653, and a third and last in 1712. In 1535 the Pays de Vaud was wrested by Bern from the Duke of Savoy, who was, however, obliged to acknowledge the independence of Geneva in 1603. In 1648, at the Peace of Westphalia, the independence of S. was formally ratified by the Emperor. From this period S. began to decline, and many of her citizens, disheartened by civil discords at home, sold their swords to foreign powers. The popular discontent with the government, and the contagious principles of the French revolutionists, created a large anti-national party within S., by whose influence the French invaded the country and subdued it, in spite of a heroic resistance on the part of Bern and Unterwalden. By the Peace of Lunéville (1801) the French were obliged to evacuate S., but in 1802 the Act of Mediation, framed by Napoleon (then First Consul of France), and accepted by the Swiss, constituted S. a republic of nineteen equal cantons. under the protection of France, to which, however, Geneva, the Valais, and Neuchâtel were annexed. The Congress of Vienna in 1815 restored its independence to S. within its former limits, and constituted twenty-two cantons, represented in a Federal diet which assembled once a year alternately at Bern, Zurich, and Lucerne. During the fifteen years that elapsed between 1815 and 1830 S. enjoyed profound tranquillity, but in the latter year disturbances broke out, in consequence of the infection of the French revolution, and most of the cantons were obliged to grant universal suffrage. The town of Basel, however, held out, and consequently Basel was divided into two half-cantons, the town remaining conservative while the country became democratic. General dissatisfaction, however, still prevailed, and in 1832 the three Catholic cantons of Schwyz, Uri, and Unterwalden formed the League of Sarnen, which was afterwards joined by Lucerne, Freiburg, Zug, and Valais. In 1839 the Diet passed a law to make education independent of the clergy, in consequence of which the Jesuits became the direct objects of liberal antagonism. A body called the Free Corps was organised to carry the law into effect, but was defeated on its entrance into Lucerne. The League of Sarnem was now dissolved, and the Sonderbund or separate League of the Seven Catholic Cantons formed (1846) for mutual defence against the Free Corps. The Diet having declared the Sonderbund illegal (July 29, 1847), decreed the expulsion of the Jesuits (September 3), and on the refusal of the Sonderbund, the federal army under General Dufour invaded the Catholic cantons, and forced them to submit after defeats at Freiburg (November 13) and Lucerne (November 24). The Catholic cantons were now compelled to eject the Jesuits, to suppress the monasteries, and pay the expenses of the war. On September 12, 1848, a new Federal Constitution was promulgated, similar in many respects to that of the United States, but which has been considerably modified by the changes of 1874. By a treaty, signed 26th May 1857, the principality of Neuchâtel (q. v.), which had descended to the kings of Prussia from its adjudication in 1707 to Friedrich I., was resigned to S. notwithstanding the opposition of Friedrich Wilhelm IV., while it received a constitution similar to that of the other cantons. Since that period, with the exception of her having protested in 1860 against the transference of Savoy to France, and as a neutral power interned the army of Bourbaki under General Clinchant in 1870, S. has taken no part in foreign politics, but devoted herself to her internal affairs, and has enjoyed a tranquil and well-deserved prosperity. See J. Meyer, *Land, Volk und Staat der Schweiz Eidgenossenschaft* (2 vols. Zür. 1861); J. Garster, *Atlas der Heimathskunde der Schweiz* (Bern 1872); Max. Wirth, *Allegemeine Beschreibung und Statistik der Schweiz* (3 vols. Zür. 1871-76); *S. and the Swiss*, by an American Resident (New York 1875); George Grote, *Letters on the Politics of S.* (Lond. 1876); Gourdault, *La Suisse* (Par. 1878); and for history, Johannes von Müller, *Geschichte der Eidgenossenschaft* (13 vols. Leip. 1806-51); Vogelin, *Geschichte der Schweiz Eidgenossenschaft* (4 vols. Zür. 1861); Dagnet, *Histoire de la Confédération Suisse* (6th ed. Neuchâtel 1867).

Swiv'el, a link of a chain which turns round on a pin or axis fixed to the next link; also applied to a cannon adjusted to turn on a pivot, or to run on concentric rails, so that it may be fired in any direction. S.-joints assume many varieties of form adapted to special uses.

Sword, a weapon for cutting and thrusting, used by all nations from the remotest times. It is composed of the *blade* and the *hilt*. The blade is single or double-edged, and varies in form (see RAPIER, SABRE, SCIMITAR, CUTLASS). The hilt embraces the *grip* or handle, which covers the *tang* of the blade, the *pommel*, the *guard* for protecting the hand, sometimes with branches termed *quillons*, and the *counter-guard;* these parts are seldom all found together on one hilt. Ancient swords had no guard. Bronze swords with lanceolate blades were carried by the Belgic Britons. Damascus blades were formerly highly esteemed. Toledo and Solingen at present excel in the manufacture of swords.

Sword'-Fish (*Xiphias gladius*), a species of *Teleostean* fishes belonging to the *Scomberidæ*, or Mackerel family. The upper jaw is very long and pointed in the form of a sword, which the fish has driven in some instances entirely through the keel of a vessel. The dorsal fin is long and spongy, but the ventrals are wanting or small. The tail-fin is prominently forked. The S.-F. attains a length of from 10 to 15 or even 20 feet. It is common in the Mediterranean Sea and Altantic Ocean, but comparatively rare round the British coasts. Its flesh is highly palatable. The *Histiophorus bimaculatus* is another species of S.-F., often named the purple-finned S.-F. or sail-fish and fan-fish.

Syb'aris, a city of Magna-Græcia, near the western shore of the Tarentine Gulf, between the rivers Sybaris (*Coscole*) and Crathis (*Crati*). Founded by Achæans (720 B.C.), it was the earliest of the Grecian colonies, and reached its zenith in the 6th c. B.C., holding sway over twenty-five tributary cities, and enjoying a wealth and luxury that are yet proverbial. Its fall was as sudden as its rise was rapid. A demagogue Telys, having driven its oligarchs from power, called on Crotona, where they had taken refuge, to give them up, and marched with an army of 300,000 men to enforce the demand. The Crotoniats, with scarce a third the number, defeated him utterly on the banks of the Trais (510 B.C.), and razing S. to the ground, diverted the Crathis so that its waters flowed where the city once had stood. See CROTONE.

Syb'el, Heinrich von, German historian, was born at Düsseldorf, December 2, 1817, and studied history at Berlin under Ranke. In 1841 he published a *Geschichte der ersten Kreuzzugs*, and was appointed professor at Bonn. After the publication (1845) of his *Entstehung der deutschen Königthums*, he removed to Marburg, became a member of the assembly of the estates Hessen-Kassel in 1847, and in 1850 its representative at the Reichstag at Erfurt, but soon retired for a time from public life to the preparation of the first part of his great work, *Geschichte der Revolutionszeit 1789-95* (3 vols. 1853-57; 3d. ed. 1866) *und 1795-1800* (1870 *et seq.*). In 1856 S. started the *Historische Zeitschrift*, became professor at Munich, and secretary of the historical commission for the publication of a series of German records. He returned to Bonn in 1861, was from 1862 to 1864 a member of the Prussian Landtag, and in 1867 of the first North German Reichstag, where he went with the national Liberal Party. S. was in 1875 appointed director of the archives at Berlin. His chief other works are: *Die Erhebung Europas gegen Napoleon I.* (1860), *Prinz Eugen von Savoyen* (1861), *Die deutsche Nation und das Kaiserreich* (1863), *Kleine historische Schriften* (2 vols. 1863-69), *Oesterreich und Deutschland in Revolutionskrieg* (1868).

Syc'amine in old authors means the woodbine. The S.-tree of the New Testament is supposed to be the black mulberry.

Syc'omore, or **Syc'amore** (*Ficus Sycomorus*, or *Sycomorus antiquorum*), of the Orient is a large spreading fig-tree, planted in villages and along the roadsides in Egypt and parts of W. Asia for the shade it renders, its crown extending to a width of 120 feet. It is believed to attain a great age. Its figs, produced in racemes, are sweet with a somewhat aromatic flavour. The

wood was used by the old Egyptians for mummy cases. The S. of St. Luke (xix. 4) into which Zaccheus climbed is this tree, and it is probable that in the sacred dramas of the Middle Ages the broad-leaved umbrageous *Acer Pseudo-platanus* was used to represent the same in Europe, thus acquiring its present name of S. In America, S. is a current name for the plane (*Platanus occidentalis*).

Syd'enham, a town and suburban district of London, forms a chapelry in the parish of Lewisham, county of Kent, 7 miles S.E. of the metropolis, with which it is connected by several lines of railway. The town occupies an elevated position, and has greatly extended since the removal from Hyde Park to S. Park of the Crystal Palace, the wonderful glass and iron structure of the Great Exhibition in 1851, at a total cost of £1,500,000. The building is 1608 feet by 312, and has besides two wings of 574 feet each. The height of the great transept is 198 feet, that of the water-towers 284, at the top of which are tanks holding 357,675 gallons for supplying fountains throwing 120,000 gallons a minute. In addition to the various art and science courts, the Palace contains two concert-halls, the larger of which can accommodate 5000 performers. The N. wing, containing the Alhambra, the Oriental and other courts, was destroyed by fire in 1866, and the damage amounted to £150,000. The great aquarium of the Palace was opened by Professor Owen in 1872. The grounds occupy more than 200 acres. Pop. of the district parish of S. (formed 1866) in 1871, 2962; of that of St. Bartholomew or Upper S., 5201.

Syd'enham, Thomas, traditionally distinguished as the 'prince of English physicians,' was born in 1623 at Winford Eagle in Dorsetshire, studied at Oxford from 1645, was elected a fellow of All Souls, and in 1648 took the degree of M.B. Desault, the author of *Recherches curieuses sur les Escholes en Médecine de Paris et de Montpellier* (Par. 1651), appears to be the only authority for the statement that he studied at Montpellier. At some date between 1649 and 1661 he settled in London as a medical practitioner, where he died 29th December 1689. S. was magnificently endowed with common sense. Though there is little doubt that he was ostracised more or less rigidly by many of his fellow-practitioners, he was the intimate friend of Boyle, Locke, and other eminent men of his time, and his memory has been revered by such physicians as Boerhaave, Stahl, Pinel, and Haller. The chief of his improvements in the healing art were the adoption of cinchona in intermittent fever, and the cooling regimen in smallpox. The following are his principal works:—*Methodus Curandi Febres* (1666), *Observationes Medicæ* (1676), *Epistola Responsoria* (1680), *Dissertatio Epistolaria* (1682) (on confluent smallpox and hysteria), *Tractatus de Podagra et Hydrope* (1683), *Schedula Monitoria* (1686). A collected edition—*Opera Universa*—appeared in 1685; and there have been numerous foreign editions both of individual treatises and of the whole works, at Leipzig, Geneva, and Venice. A new edition was published in 1844 by the first Sydenham Society (instituted 1843, dissolved 1858), under the editorship of Dr. Greenhill; and an English translation—for S. published, if he did not write, in Latin—*The Works of Thomas Sydenham*, 2 vols., followed in 1848. A new Sydenham Society for the publication of medical works was instituted in 1858. See Life of S., by R. G. Latham, prefixed to the English translation; and Dr. John Brown, 'Locke and Sydenham' and 'Dr. Andrew Brown and Sydenham,' in *Horæ Subsecivæ* (8th ed. Edin. 1873).

Syd'ney, the capital of New South Wales, and parent city of Australia, is situated on the southern shore of the beautiful inlet of Port Jackson (q. v.), about 4 miles from its entrance. S. was founded 26th January 1788, when the settlement intended to be formed at Botany Bay (q. v.) was removed to Sydney Cove. Alike for beauty and suitability for commerce, the situation of S. is one of the finest that can be imagined. The numerous bays and islands of Port Jackson, with their rocky and wooded borders, form a charming landscape, while the depth of the water allows the largest ships to discharge alongside the wharves by which Sydney Cove and Darling Harbour in particular are lined. As a rule the streets are straight, running at right angles to one another, but are narrower than those of Melbourne. The houses and shops compare favourably with those of British cities, and some of the banks are very elegant. The city is well paved, lighted with gas, efficiently drained, and well supplied with water. Among the principal buildings are the Post Office, opened in 1874; the new Town Hall (1868-78), in Renaissance style, 254 feet long by 153 broad, with clock tower 190 feet high, and containing a great hall 132 feet by 62, and 50 high; the University, whose great hall would rank among the largest of its kind in Britain; the Museum, Treasury, and Anglican and Roman Catholic Cathedrals. The University, which has an annual grant of £5000 from the public funds, possesses a royal charter, and confers degrees in arts, law, and medicine. Theological instruction is given at the three colleges of St. Paul (Anglican), St. John (Roman Catholic), and St. Andrew (Presbyterian). A new synagogue was opened in 1875 at a cost of £16,000. S. also possesses a grammar-school and other educational institutions. The S. Mint in 1877 coined 1,590,000 sovereigns. The 23 suburbs of S., though virtually composing part of the city, are under distinct municipal government. They abound in handsome villas in whose gardens semi-tropical plants flourish, and the city has also fine parks and a beautiful botanical garden. The commerce of S. with the United Kingdom, the Australasian colonies, Polynesia, China, and the United States, is very extensive, and is increasing with the progress of settlement in the interior, with which S. is connected by several lines of railway. The manufactures of S. are important, the chief being those of iron, shipbuilding, bricks, and leather, besides other extensive industries, such as flour-dressing, sugar-refining, meat-preserving, and wine-making. The situation of S., in the centre of the largest known coal-field in Australia, marks out for the city great prosperity as an industrial centre. In 1871 the pop. of S. proper, which returns four members to the colonial parliament, was 75,945, and of the suburbs 58,813, making a total of 134,758. An International Exhibition is to take place here in August 1879 under the auspices of the Agricultural Society of New South Wales.

Syd'ney or **Sid'ney, Algernon**, grand-nephew to Sir Philip, was born in 1622, and accompanied his father, the Earl of Leicester, on embassies to Denmark (1632) and France (1636). In 1641 he commanded a royalist troop of horse in Ireland, of which the Earl was then lord-lieutenant, but two years later crossing to Liverpool cast in his fortunes with the Parliament. With the rank of lieutenant-colonel he fought and was wounded at Marston Moor (1644), next served as lieutenant-general of the horse in Ireland (1646), and, returned to Parliament by Cardiff, acted as one of Charles's judges. That he withheld his hand from the death-warrant was probably due to family motives, for ten years later he justified the king's execution as 'the justest and bravest action ever done in England.' Cromwell's protectorate offending this hot republican, he withdrew to Penshurst, the Leicesters' Kentish seat, but re-emerged with the Long Parliament remnant (1659), and was sent to Denmark to patch up the Swedish war that again broke out after the Peace of Roeskilde. With the Restoration his brief diplomatic career came to an end, and seventeen years of exile in Germany, Italy, and France began. During this period, about 1665, having vainly endeavoured to bring about a Dutch invasion of England, S. sought to obtain 100,000 crowns from Louis XIV. for the re-establishment of an English commonwealth; and when in 1677 a royal pardon let him return to England, he became a pensioner of Barillon, the French ambassador, whilst leaguing with Russell, Essex, and Shaftesbury to further the claims of Monmouth, the son of his cast-off mistress. In 1680 the Countess of Sunderland, his sister Dorothy, writes:—'Mr. Algernon is busy, about what, God knows. Last night he was called out of my chamber by a Quaker'—Penn, possibly, who consulted S. on his Pennsylvanian constitution. His business, at any rate, alarmed the court, and on the first announcement of the Rye-House Plot, S., like Russell (q. v.), was arrested and brought to trial for high treason. 'Whether he was less guilty than Russell may be doubted,' says Ranke, 'but the proofs against him were still more unsatisfactory;' they were, however, sufficient for Jeffreys and a packed jury of the times. On 7th December 1683 he died upon Tower Hill, by his unjust death earning the little-merited title of 'martyr in freedom's cause.' His *Discourses concerning Government* were published by Toland (1698; 4th ed. 1772), and his Life has been written by Meadley (Lond. 1813); Van Santvoord (New York 1851), and Ewald (2 vols. Lond. 1873). See also vols. ii. and iii. of Ranke's *History of England* (Eng. trans. Oxf. Clar. Press 1875).

Sye'ne. See ASSOUAN.

Sy'enite, an important rock, the type of one great division of the Plutonic series, as granite is of the other. S. differs from granite in containing little or no quartz, in having hornblende in place of mica, and in not containing more than 50 or 60 per cent. of silica. The name is derived from Syene, the Greek form of Assouan (q. v.).

Syll'ogism (Gr. *syn*, 'with,' and *logos*, 'reason') is the name given in the science of logic to that process of reasoning whereby we infer one thing from another through means of a middle term. Thus the following reasoning—all men are mortal; poets are men, therefore all poets are mortal—is a S.: 'men' is the middle term, and by predicating of it the attribute mortality, and then bringing all poets under it, we are enabled to arrive at the conclusion that the attribute mortality belongs to all poets. The parts of a S. have various technical names; thus in the above example the predicate (viz., mortal) of the conclusion (therefore all poets are mortal) is called the major term, the subject (poets) is called the minor term, whilst the first premiss or statement is called the major, and the second the minor premiss. A S. must belong to one of four *figures*, and these are determined by the position of the middle term, which of course must occupy one of four positions. In the first figure it is subject in the major premiss and predicate in the minor; in the second it is predicate in both; in the third it is subject in both; in the fourth it is predicate in the major and subject in the minor. Rules are given by logicians to try each figure, and the result is that nineteen valid *moods*, as they are called, remain after those which involve a breach of rule are cleared away. There are four in the first figure, four in the second, six in the third, and five in the fourth. These are generally committed to memory by a curious system of mnemonic lines, and the moods are named from the words in these lines. The one we have given is called Barbara. We owe the first three figures to Aristotle, and the fourth to Galen. They are professedly a complete analysis of the reasoning process, and it was maintained that all human reasoning must of necessity be expressed by means of them. J. S. Mill and others have denied this. They affirm that all valid inference is from the known to the unknown, whereas in a S. the conclusion only tells us what we knew before, for of course we start with the assumption that we are assured of the truth of the premisses. Mill maintains the S. is merely of use as a record of knowledge; that it is a convenient form, but not essentially an instrument of discovery. The inquirer will find full details of the nature and functions of the S. in any of the ordinary logical text-books. Jevons' *Lessons in Logic* (4th ed. London 1874) may be mentioned as a particularly good compendium. For discussions as to the more recondite points, the Logics of Hamilton, Ueberweg, (translated by Lindsay), and J. S. Mill may be consulted.

Sylphs, in the Paracelsian mystic system, are the fair, tricksy Elemental Spirits (q. v.) inhabiting the air. They figure in Montfaucon Villars' *Comte de Gabalis* (1670); and in Pope's *Rape of the Lock* we find them, both male and female, with 'fluid bodies' and 'transparent forms.' Now the word *sylph* has always a feminine signification.

Sylves'ter, the name of two Popes.—**S. I.** (314-35), according to Roman Catholic tradition, played a prominent part in the ecclesiastical controversies of his time, had precedency given to his legates at church synods and at the Council of Nicæa, converted the Emperor Constantine to the faith, and was rewarded with the famous 'donation' of land and supremacy over all the West. History tells next to nothing of S. I., who is a saint of the Roman Catholic Church, his feast falling on the 31st December.—**S. II.** (999-1003), originally called Gerbert, was born of poor parents at Auvergne in France, acquired extraordinary learning, became abbot of Bobbio, and was by the ignorant regarded as a sorcerer on account of his knowledge of chemistry and physics derived from Spanish Arabs. The Emperor Otto II. entrusted to him the education of his son, afterwards Otto III., and he was also tutor of Robert, son of the French king Hugo Capet. Through the influence of Otto III. he was elected first Archbishop of Ravenna (998), and then Pope (999); but no sooner had S. gained the Papal chair than he forgot all the liberal views of the relation between Pope and Councils which he had previously defended, and his early death alone prevented a conflict with the emperor. A century before the first Crusade, he planned a general levy of Christendom to drive the infidel from Palestine. See Hock's *Gerbert oder Papst. S. II. und sein Jahrhundert* (Vien. 1837) and Büdinger's *Ueber Gerbert's wissenschaftliche und Politische Stellung* (Kassel 1851).

Sylves'ter, James Joseph, F.R.S., a distinguished mathematician, was born at London, September 3, 1814. He graduated second wrangler at Cambridge in 1837, but being a Jew, was disqualified from entering for the Smith's Prize. He was professor of natural philosophy in University College, London, till 1855, when he became professor of mathematics at the Royal Military Academy, Woolwich. In 1876 he was appointed to the mathematical chair at John Hopkin's University, Baltimore, U.S. His numerous valuable papers are of great originality; and to him and Cayley the development of the higher algebra is mainly due. His last and best work is the application of the chemical atomic theory as an illustration of the theory of invariants and covariants of binary quantics, published in the *American Journal of Mathematics* (parts I. and II., 1878), which is edited by S.

Sylves'ter, Joshua, an English poet, born in 1563, died at Middelburg, in Holland, in 1618. Of the numerous translations and poetical effusions with which he occupied the leisure of a mercantile and wandering life, two only can be said to have escaped oblivion—*Tobacco Battered and the Pipes Shattered by a Volley of Holy Shot thundered from Mount Helicon*, and his translation of the once all-famous *Divine Works and Days* of the French poet Du Bartas, which is thought to have afforded some suggestions to Milton for his *Paradise Lost:* and even of these two little more is known to the ordinary student of English literature except the titles. Two editions of S.'s works appeared respectively in 1633 and 1641. A reprint of the 1641 edition forms part of Mr. Grosart's *Chertsey Worthies' Library* (privately printed 1878).

Sylvi'adæ, a family of *Dentirostral* Insessores (q. v.) including the various species of warblers; *e.g.* the chiff-chaff, willow-warbler, white-throat, wood-warbler, blackcap-warbler, and other forms.

Symbol'ic Books of a church are the creeds and Confession of Faith of that church, containing its distinctive principles. Symbol (Gr. 'a sign') was the title applied to the Confession of Faith of the early Christians, as a sign of what they believed. It was afterwards applied in the sense of a watchword, and at Alexandria of a pass-word of the initiated.

Syme, James, a celebrated Scotch surgeon, was born in Fifeshire in 1799, and educated at the University of Edinburgh. While still an undergraduate, he was appointed by Liston demonstrator in anatomy, and in 1825 began his lectures on surgery, at first as an extra-mural teacher, but from 1833 as occupant of the chair of surgery, which, with a six months' interval spent in London in 1847, he filled with the greatest distinction till his death, June 26, 1870. Both as an operator and as a teacher, S. had few equals. Perhaps his most wonderful operation was his method of amputating the foot at the ankle-joints. The most important of S.'s works is his *Principles of Surgery* (1st ed. 1832; new ed. 1863; Philadelph. 1866). See Paterson's *Memorial of J. S.* (Lond. 1874).

Symm'achus, Quintus Aurelius, a Roman statesman of the 4th c. A.D., and one of the last great advocates of Paganism, was educated in Gaul, and after serving as quæstor and prætor became Corrector of Lucania and the Brutii (365) and Proconsul of Africa (373), and member of the pontifical college. His petition to Gratian, urged on the senate's behalf, for the restoration of the altar of Victory, proved unavailing (382), as did the extant letter addressed by him when præfect of the city (384) to Valentinian. The failure led him to side with the pretender Maximus (387), and for so doing he was impeached of treason, but pardoned, and raised to the consulship (391). His death must have taken place after 404, and we have by him ten books of letters (Leyd. 1653), and fragments of nine orations, the latter discovered and edited by Mai (Mil. 1815). 'Even saints,' says Gibbon, 'and polemic saints, treat S. with respect,' though Prudentius likened the use to which he applied his talents 'to one digging in mud with an instrument of gold and ivory.' See Morin's *Études sur la Vie et les Écrits de Symmaque* (Par. 1847).

Symm'etry, a word used in zoology to denote (1) the general plan or type of arrangement of the elements of the body. Thus in star-fishes, sea-urchins, &c., these elements are arranged

in a *radial manner;* in *Annulosa* in a *zonal* manner; and in Vertebrata, &c., in *bilateral* fashion. (2) S. *of organs* denotes the disposition of such organs in Vertebrate animals as are disposed symmetrically in the body (*e.g.*, lungs).

In botany, S. is the orderly and similar distribution of a certain number of parts in plants. It generally expresses this numerical relationship between sepals, petals, and stamens.

Sympathet'ic Ink. See INK.

Sym'pathy (*sympatheia*, 'fellow-feeling') is an original principle of our nature which causes us to take a lively interest in the joys, sorrows, actions, &c., of our fellow-men, and which moves us to act in accordance with that interest. Brown, Hume, Smith, and other English moralists have founded their ethical theories on S.

Sym'phony (It. *sinfonia*), the most important class of instrumental compositions, a work in sonata form for the entire orchestra. From the etymology of the word (*sun*, 'with,' and *phōnē*, 'voice') it is evident that the voice anciently entered into the S. The S. as known now, as a colossal orchestral work, did not exist till the 18th c., the *Concerte Grossi* of Corelli being the first attempt of the kind. To Haydn's great erudition, wealth of melody, and command of the orchestra, we owe the popularising of the S. Mozart's brilliant genius assisted in its development. Beethoven is the greatest of all composers in this form, his nine symphonies being among the most stupendous products of musical art. Mendelssohn, Schubert, Schumann, and Rubinstein are among the modern masters of the S. which offers the grandest opportunities to composers for the display of every musical resource. A S. has usually four movements similar to those described under SONATA. The word was formerly applied to an overture, and is still used to designate the instrumental passage introducing or closing a vocal piece, or occurring during pauses of the voice.

Syn'agogue (Gr. *synagōgē*) had in the Septuagint (q. v.) the special meaning of 'an appointed meeting of people either for civil or religious purposes,' being used in that sense as synonymous with *ekklēsia* ('church'). In the New Testament both words are used for a congregation or assembly for public worship, either of Jews or Christians (S., Jewish, Acts ix. 2; Christian, James ii. 2; church (*ekklesia*), Jewish, Matt. xviii. 17, Christian, Rom. xvi. 5), as well as for the place in which the congregation met (James ii. 2 and 1 Cor. xi. 18). When the Christian Church separated itself completely from the Jewish, the name S. was applied exclusively to the worshipping assemblies of the Jews and the buildings in which they met, and church to those of the Christians.

The following description is that of the Jewish S. at the time of Christ. According to the Jewish canons, the S. had to be built on the most elevated ground in the neighbourhood. But the riverside outside the city was also deemed a suitable locality on account of the quietness and of the supply of water, which was needed for baptism and ablutions (*cf.* Acts xvi. 13). The building was generally in the form of a theatre, with the door so placed that the worshippers had their faces turned towards Jerusalem; and it was generally, like the Temple, roofless (*cf.* Juvenal, *Sat.* xiv. 98). The S. of each town was governed by the members of the local Sanhedrim (q. v.), who were hence called 'elders' (Luke vii. 3), shepherds (Acts xx. 28), 'overseers' (Eph. iv. 11), 'pastors,' and rulers of the S. (Mark v. 22). The president of the sanhedrim was the head of the S., and was assisted in the administration of the law by two judicial colleagues. Other officials were (1) three almoners (deacons), (2) the legate of the S., one of the congregation who was delegated on each occasion to go before the Ark and conduct divine service. (3) The interpreter, who was required to explain the Scriptural Hebrew in the Aramaic, which was the vernacular of later times. (4) The chazan in the time of Christ held the position of sexton or beadle, but in the 6th c. A.D., when the ancient practice of appointing a legate at each meeting for worship was discontinued, he became the regular reader of the liturgy. (5) The ten Bathanim or Men of Leisure: no place could legally have a S. in which there were not ten independent men who could come to the S. and form the legal congregation when required. There were regular meetings for worship, at which there had to be present at least ten men above the age of thirteen every Monday and Thursday, on which days pious Jews fasted (*cf.* Luke xviii. 12), every Sabbath, and on festivals and fasts. A liturgy, compiled largely from the Psalms, was used in public worship, lessons were read from the Law and the Prophets, and on certain days homilies were delivered by the Rabbins. See Buxtorf, *Synagoga Judaica* (Basel, 1680), Zunz, *Der Ritus des Synagogalen Gottesdienstes* (Berl. 1859), and Ginsburg in Kitto's *Cyclo. of Bib. Lit.* (3d ed. Edin. 1876).

Syn'agogue, The Great, denotes the council at Jerusalem, after the return from Babylon (B.C. 536), which was appointed by Nehemiah towards the close of his life, probably about B.C. 410. According to tradition it consisted of 120 members belonging to five different classes: (1) the chiefs of the priestly divisions (Neh. x. 1–8, *cf.* 1 Chron. xxiv. 7–18); (2) the chiefs of the Levitical families (Neh. x. 9–13, *cf.* ix. 4, 5; Ezra viii. 18, 19, 24); (3) the heads of the Israelite families; (4) elders or representatives of cities, and (5) Doctors of the Law. Afterwards, however, the number of members diminished, so that when, on the death of Simon the Just (B.C. 300), the G. S. was changed into the Great Sanhedrim (q. v.), the number was only 70. The members came under a solemn oath (1) not to intermarry with heathen; (2) to observe the Sabbath and (3) the Sabbatical year; (4) to pay annually a third of a shekel to the sanctuary; (5) to supply wood for the altar, and (6) regularly to pay the priestly dues (Neh. x. 28–39). Their after work was (1) the formation of the canon of Scripture, (2) the compilation of the synagogue ritual, (3) the establishment of schools for the study of the Law, and (4) the definition of the precepts thereof. See De Wette, *Die Einleitung in die Kanonischen und Apokryphischen Bücher des Alten Testamento* (8th ed- 1869); Herzog, *Real-Encyclopædie* xv. 296 *et seq.*, and Ginsburg in Kitto's *Cyclo. of Bib. Lit.* (3d ed. Edin. 1876).

Syncli'nal Ax'is. See CURVES ANTICLINAL AND SYNCLINAL.

Syncopa'tion (Gr. *sun* and *kopto*, 'to cut off') in music, an inversion of the musical rhythm, having the effect of placing the accent upon the usually unaccented part of the bar. This is usually done by the introduction of a driving note.

Syn'cope. See FAINTING.

Syn'cretism (Gr. *syn*, 'together,' and Lat. *cerno*, 'to perceive') was a term first used by the Calvinist, David Pereus, in his work *Irenicon* (1614), in which he made an attempt to allay the spirit of dissension to which the Reformation had given rise. The Lutheran George Calixtus (q. v.), however, took a more prominent part in the work of reconciling the separated parties, and gave rise to the so-called Syncretistic Controversy. The real aim of the teaching of Calixtus was to induce the three leading branches into which the Church was divided—the Roman Catholic, Reformed, and Lutheran—to abstain from their mutual hatred and enmity, and to cultivate mutual love and goodwill. His opponents supposed or represented it to be that he wished the three to unite and form one body. See Gass, *G. Calixt. und der Synkretismus* (Bresl. 1846).

Syn'dic (Gr. *syndikos*, from *syn*, 'with,' *dikē*, 'justice'), the title up to the Revolution in various towns of Southern France of the chief magistrate, as formerly also at Geneva. It is now borne by officers charged with the task of watching the interests of a company or association, or by persons appointed to manage a bankrupt's property. In the University of Cambridge, syndics are chosen from the Senate for the transaction of special business, such as the forming of laws, regulation of fees, &c.

Synec'doche (Gr., 'understanding one thing by means of another') is that figure of speech in which a part stands for the whole, or *vice-versa; e.g.*, 'ten *sail* of the line,' 'fifty *head* of cattle.'

Syner'gism (Gr. *synergeia*, 'co-operation') is a theory of Regeneration, nearly the same as Semi-Pelagianism (q. v.), according to which it is maintained that the human will cooperates with the Holy Spirit in the renewing act. A controversy arose in the Lutheran Church in the 16th c., called the Synergistic Controversy, between the strict Lutherans, who held the impotence of man to regenerate himself, and those—including Melanchthon in his later writings—who held that some agency of the human will accompanies the influence of God's Spirit.

Syne'sius, the Philosopher, was born of Heracleid descent about 370 A.D., at Cyrene, a city of the Libyan Pentapolis. There he passed his boyhood, and after brief military service repaired to the famous Alexandrian schools, where he became Hypatia's favourite pupil. A visit to Athens ended in disappointment, 'Athens retaining nothing of splendour but a name that once was famous;' he returned to Cyrene, and in 397 was sent on an embassy to Arcadius at Constantinople, his residence for the next three years. The extant oration, *Peri Basileias*, a bold discourse on a ruler's responsibilities, received the emperor's approbation, and won great privileges for the Pentapolis. At Constantinople he may have heard St. Chrysostom, and when in 403 he revisited Alexandria, the Patriarch Theophilus induced him formally to become a Christian neophyte, and marry a Christian wife. This marriage, and his still semi-pagan opinions, stood in the way of his accepting the bishopric of Ptolemais, to which he was elected in 409; but when Theophilus consecrated him a twelvemonth later, he seems to have renounced the married state. His episcopate, marked by the fearless excommunication of Andronicus, tyrannical governor of the Pentapolis, and by his steadfast opposition to the Arians, was short, since he died, according to Druon, in 413. The 'Squire Bishop'—as Kingsley styles S. from his love of field-sports—became, like Tillotson, 'a father of the Church without having been her son;' and his works, those even after his conversion, retain the literary cult of Paganism. We have by him two homilies, ten hymns, 157 charming letters (394-413), some fantastic Neo-Platonic treatises, &c., but of the dramas mentioned by himself not one survives. The best complete edition is Morell's, with Petavius' Latin rendering (2d ed. Par. 1640), and there is an excellent French translation by H. Druon, with a biography prefixed (Par. 1878).

Syn'od (Gr. *synodos*, 'a public feast'), as used in the Christian Church, meant at first an assembly of the faithful, but was afterwards exclusively applied to a meeting of bishops or Church Council. In this sense the chief kinds of S. are the following:—(1) Œcumenical (q. v.), to which the bishops and principal dignitaries of the whole Church were summoned; (2) general—either of the Eastern or the Western Church; (3) national—as Spanish, &c.; (4) provincial—convened by a metropolitan from his province; (5) united—of several provinces; (6) diocesan—of a bishop and his clergy. In the Presbyterian Church, the S. is the court next to the General Assembly (q. v.), when there is one, and is composed of the members of all the Presbyteries (q. v.) within a certain district.

Synod'ic, in astronomy, is the term applied to the orbital revolution of a planet or the moon when the period of revolution is measured between two successive conjunctions or oppositions. The S. month is the same as the lunar month, or lunation.

Syn'onyms (Gr. *syn*, 'with,' and *onoma*, 'name'), words apparently identical in meaning, as 'rich' and 'wealthy,' 'country' and 'land.' In Mythology (q. v.) it has been pointed out how the number of roots must at the beginning of human speech have been almost infinite, and how the same object might be designated by a great variety of names—a snake, for instance, being called *serpens* ('creeper') or *anguis* ('throttler'). Such names applied to the same object, though each originally conveying a different conception, would with lapse of time come to be regarded as absolutely identical in meaning, would in fact become synonymous. Then the principle of conservation of energy steps in, and men begin either to drop superfluous S. or to establish slight shades of meaning, the latter process being especially noticeable in the case of S. due to foreign borrowings. Thus in English 'ox' and 'beef,' or 'sheep' and 'mutton,' are now no longer synonymous; while 'ship' and 'skiff,' 'crab' and 'crayfish' (Fr. *écrevisse*), etymologically the same, have likewise been differentiated or desynonymised.

Syno'via and **Syno'vial Mem'brane**. S. is a glutinous fluid secreted by synovial membranes. Synovial membranes are simply modifications of serous membranes, and they invest the tendons and sinews that play over joints and otherwise assist articulations. The synovial fluid is therefore merely a secretion from a serous membrane. It appears, however, to differ in certain particulars from ordinary serous secretions, and is more dense and viscid than ordinary serum. Hence S. is often popularly named 'joint-oil.' In S. an abundance of albumen is present. Synovial membranes also invest the *bursæ*, or little pads which underlie such tendons as those of the extensor muscles of the thigh, in which tendon the *patella* or knee-cap is developed. Synovial membranes are liable to inflammation, known as *synovitis*.

Syn'tax (Gr. *syn*, 'together,' and *taxis*, 'an arranging') is that division of grammar which concerns itself with the proper construction of sentences. The rules of S. are statements of the ways in which the words of a sentence are related to each other. Uninflected languages have necessarily a much less elaborate S. than inflected ones; and much error and nonsense abound in manuals of English grammar owing to the persistent folly of applying to our S. the Latin rules of concord and government.

Syn'thesis, in chemistry. See CHEMISTRY.

Syn'tonin, a substance very closely allied to *Fibrin* (q. v.), and which is obtained from *myosin* by the action of dilute acids. *Myosin* itself is the substance which is found in a coagulated state in muscles after death. S. is an albuminoid substance containing carbon, hydrogen, oxygen, and nitrogen, with traces of sulphur. It appears to exist as an essential element of all contractile tissues.

Syph'ilis is, according to Dr. Farr, a disease belonging to the enthetic order of Zymotic Diseases (q. v.). It may be defined as 'a specific disease produced by the contagion of the same disease in another person, and characterised (1) in its primary form by the appearance on the part inoculated of one of two different kinds of sore or *chancre*, and (2) in its secondary or constitutional form by various eruptions on the skin, by sore throat, affections of the eye, the glands, the bones, and almost every other tissue of the body.' The contagion may be conveyed by direct inoculation during sexual intercourse; accidentally, in other forms of personal contact; and purposely, by inoculation for medicinal or experimental purposes. There are two kinds of chancre, and in one the disease is merely local, never affecting the constitution; but in the other the constitution is affected, and the disease may break out after long intervals of health, and may be transmitted from one generation to another through the blood of the mother or the semen of the father.

The *local* form of S. appears in three principal varieties—(1) *The common soft chancre unaccompanied by bubo;* or *suppurative syphilitic inflammation.* Three or four days after inoculation the sore appears and begins to suppurate at once. The sore has a punched-out appearance, its edges are slightly undermined, and its base is thickened by inflammation of the parts underneath it. The sore heals with no remaining induration in three or four weeks. (2) *The sore with suppurating bubo;* or *ulcerative syphilitic inflammation.* The sore is ragged and has a worm-eaten appearance, the glands and the absorbents are affected, and specific abscesses may form in the course of the latter, but no part of the body beyond the gland is affected. In these two forms the treatment consists in keeping the part clean, applying a mercurial wash, poulticing the bubo, and opening it as soon as it suppurates. (3) *Sloughing and gangrenous sores.* In this form the sore may slough and become gangrenous as soon as it is formed, or a previously formed sore may take on a sloughing action. The absorbents are not affected, nor is it followed by secondary symptoms, but the sloughing may proceed with great rapidity, and may prove fatal from exhaustion or hæmorrhage. The treatment consists in poulticing with charcoal or yeast, and if the sloughing action does not extend deeply, nitric acid may be applied; but if the slough is deep, lotions of nitric acid or carbolic acid, or iodoform, may be applied.

The *constitutional* form of S. is distinguished by the appearance on the part affected of a sore called the *hard* or *Hunterian* chancre, and by a chronic engorgement of the lymphatic glands, forming a bunch of hard knobs under the skin. The sore may appear in from three to five days after exposure to contagion, and it may vary as the disease is derived from a primary or a secondary sore. Lancereaux found that the mean period of incubation with matter from secondary sores, in cases of experimental inoculation, was twenty-eight days; but in two cases, in which the disease was derived from a primary sore, the period was eighteen days. Mr. Holmes says:—'Slight itching is first noticed at the part, then redness, and a small vesicle forms, which soon cracks, and induration shows itself at the base of the crack; the sore spreads and becomes excavated and glazed, with little or no granulation on its surface. Its natural secretion, if examined microscopically, is found not to be purulent, but to con-

tain only a little granular matter, though the sore can be made to suppurate by the friction of the clothes or by irritating applications. The hardness at the base of the ulcer, from which the sore takes its usual appellation, is of a peculiar kind different from that which is found at the base of a phlegmonoid soft sore, in this that in the Hunterian chancre the hardening feels as if due to a layer of parchment or other hard material let into the tissues; that is to say, it is of limited thickness, and abruptly ceases where the healthy tissues commence; while the hardness at the base of the phlegmonoid sore being due to the infiltration of lymph from common inflammation of the cellular tissue, is of a much less defined character, extends further, and fades away much more gradually into the healthy tissues.' Besides the Hunterian chancre, Mr. Lee describes two forms of infecting S., unassociated with ulceration; viz., (1) a pimple, the cuticle appearing as if peeled off the upper part of the glans penis, or a circumscribed patch remaining for days together, with a separation of epithelial scales mixed with lymph-globules from the surface, but with no specific induration; and (2) an indurated tubercle formed below the skin or mucous membrane without any visible loss of substance.

The general opinion of the medical profession is that the *constitutional* form of S. can be treated efficiently by mercury only, and that the treatment should commence as soon as the disease declares itself. The mildest form is the blue pill, which may be given in doses of 3 or 5 grains twice a day in combination with ¼ or ½ grain of powdered opium. This should be continued for about six weeks, or until the sore has been cured, and all hardening around it and around the bubo has disappeared. Mercury may also be given endermically by inunction or fumigation.

The *secondary* symptoms of constitutional S. do not usually appear till after the primary sore has healed; but the period is quite uncertain, though, in the majority of cases, it is under half a year. The secondary symptoms are sometimes ushered in by what is termed the syphilitic fever; but they are generally in the throat, the sore-throat being due to an eruption on the mucous membrane of the mouth or fauces; or in the skin, being usually either roseola, lichen, acne, mucous tubercle, pityriasis, psoriasis, or lepra. These eruptions are distinguished from other eruptions, which are not specific, partly by their coppery colour, and by their circular or horse-shoe form, and by their tendency to disappear at the centre and spread from their edges. The eye and the larynx are affected in the later secondary stage. Periostitis or nodes are also seen at this period. Other secondary symptoms are the development of mucous tubercles—flat, raised, oval patches, generally situated at or near the junction of the skin and mucous membrane, and yielding a contagious secretion, probably a fertile source of inoculation. The mucous tubercle generally disappears rapidly under the local application of calomel. Syphilitic vegetations and condylomata are also contagious.

In the treatment of secondary S., it is now generally admitted that the administration of mercury is necessary for the complete eradication of the syphilitic diathesis. Mr. Holmes says, 'No hesitation need be experienced in prescribing mercury in cases where there is no ulceration or suppuration; but when this is the case, mercury is generally held to be contra-indicated. . . . The administration of iodine and mercury together is a very successful plan of treating secondary S. Thus the iodide of potassium may be given in doses of from 5 to 10 grains while the patient is undergoing a course of mild mercurial fumigation.'

The *tertiary* stage of S. is distinguished from the secondary by the occurrence of an interval of health of longer or shorter duration—days, months, or even years—and is characterised by a reproductive process. Lancereaux describes this stage as that of gummatous products, or tertiary and quaternary affections. The affections of the skin are of the suppurative and ulcerative type, such as rupia and ecthyma. The tissues of the bone rapidly soften, and become carious or necrosed. The glands are also deeply affected, even the great secreting and blood glands—the liver, spleen, thyroid, &c. The nervous system is also affected by tertiary deposits in the nerve-structures or their membranes, leading to irritation or paralysis. The treatment of the tertiary stage must be conducted on the same principles as that of the secondary stage.

Infantile or *congenital S.* is transmitted to the fœtus *in utero*, either through the blood of the mother or the semen of the father, or both, and is a form of secondary S., differing from it only in that the primary sore has occurred on the body of the parent instead of the infant itself. The disease is characterised by a persistent coryza, a reddish or coppery eruption—roseola or lichen—especially on the genitals and on the palms and soles. Crescentic patches of mucous tubercle are common on the interior of the mouth, the lips, and anus, and there is a peculiar yellowish complexion. The treatment of congenital S. consists in the administration of mercury; 1½ or 2 grains of grey powder with 3 grains of compound chalk powder may be given twice a day, and should be continued for about six weeks, and for a fortnight after all traces of the disease have disappeared. See Holmes' *System of Surgery; A Summary of the Evidence adduced before the Committee appointed to inquire into the Pathology and Treatment of the Venereal Disease*, by Mr. Venning, in 5th vol. of the *St. George's Hospital Reports*, 1867; *Treatise on Syphilis*, by Lancereaux, translated for the New Sydenham Society; and *Lectures at the Royal College of Surgeons*, by Mr. Lee (1875).

Syphilisa'tion is the term used to designate the process of inoculating a patient from the original sore in three or four places in a different part of the body, usually the thigh; from these on another part, and so on, until sometimes the whole body is covered with the marks of chancres, the object aimed at being to eradicate syphilis already existing in the body, and to secure immunity from future attacks. In 1844, Auzias Turenne, a French physician, experimented on certain of the lower animals with the view of testing John Hunter's doctrine that syphilis could not be communicated to them. By inoculation with the human virus he succeeded in producing venereal sores in monkeys, and from them he inoculated rabbits, cats, and horses. By repeated inoculations he found that a period was reached at which no further sores could be produced in the same animal, and he concluded that by prolonged inoculation the system became protected. Sperino of Turin carried out the experiments of Turenne on the human subject, and by inoculating patients suffering from syphilis by virus from a chancre, and repeating the inoculation once or twice a week, he reached a point at which the poison ceased to have any effect, and all the other sores healed. In 1851, Professor Boeck of Christiania commenced his investigation on this subject, and finally announced his belief that S. is the proper method of treating syphilis in all its stages, and that in no disease have we a more certain method of cure. This mode of treatment was followed out for a long time in some Continental hospitals, and received a full trial at the female Lock Hospital in London. As a method of treatment S. is now abandoned, at least in this country; but it is still practised as a means of diagnosis.

Sy'ra (anc. *Syros*), the most important island of the Cyclades, in the Ægean Sea, lying S. of Giura and between Thermya and Mykono. Area 42 sq. miles; pop. 40,000. The surface is hilly, but the soil is fertile, especially in the numerous narrow valleys, which yield abundant wheat, barley, cotton, figs, and olives. Wine and honey are also produced, while cattle, pigs, and goats are extensively raised. S. dates its prosperity from the Greek war of independence, during which it preserved its neutrality, and consequently became the place of refuge of thousands of the most enterprising and industrious natives of the surrounding islands.—On the E. coast is the capital **Hermopolis** or **New S.**, the seat of government of the nomarchy of the Cyclades, and one of the most important manufacturing and seaport towns of Greece. It has telegraph communication with Athens, the chief islands, and Turkey, and owns one-third of all the trading vessels of Greece with more than one-third the total tonnage. In 1841 the revenues of the municipality were £4303; expenses, £4395. In 1870, revenues, £21,645; expenses, £30,393. S. has numerous flour-mills, foundries (employing 1000 men and boys), a weaving and rope factory, and ten tanneries (employing 1500 workmen, who produced in 1875 manufactures worth £500,000). In 1876 were built at S. 65 vessels of 7359 tons (the tonnage of 21 of which amounted to 6488 tons). In the same year in the coasting trade there entered 3995 vessels of 182,595 tons and cleared 3980 of 181,550 tons; and in the foreign trade there entered 2103 vessels of 622,044 tons, and cleared 2061 of 617,003 tons. Of those that entered, 98 of 96,537 tons, with cargoes worth £306,581, were British, and of those that cleared, 97 of 96,403 tons, with cargoes worth £41,700. The total value of imports in the same year was £788,814, and of exports £238,563.

Syr'acuse, a celebrated city of Sicily, lies on the islet of Ortygia, close to the E. coast of the island, 54½ miles S.S.E. of Catania by rail. It is crossed lengthwise by two winding main streets, in the middle of the westmost of which is the cathedral, on the side of a Doric temple of Pallas, 192 feet long by 72 broad, of which 22 columns (28 feet high by 6½ thick) are imbedded in the masonry of the church. Facing the cathedral is the museum, and between this and the S. point of the islet is the Fountain of Arethusa. The 'Porto Maggiore,' to the W., is large, sheltered, and deep. S. is the see of an archbishop, and has a lyceum, a gymnasium, a technical school, and a seminary for teachers. It carries on a small trade in wine, oil, salt, &c. In 1876, 2 British ships, of 1679 tons, entered, and 10, of 1761 tons, cleared. Pop. (1876) 23,287. S. was the largest of the Hellenic cities, having, according to Strabo, a circumference of 20 miles, and a pop. of 500,000. It consisted of five distinct parts:—(1.) *Ortygia*, the primitive settlement; (2) separated by the 'small harbour' (now sanded up), *Achradina*, on the precipitous limestone cliffs to the N., with impregnable walls; (3) *Tyche*, occupying the N.E.; (4) *Epipolæ*, the W.: and (5) *Neapolis*, the S.E. corner of the steep triangular plateau to the W. of Achradina. The last four were inclosed by a wall of huge stones (402-385 B.C.). The most noteworthy sights of S. are the ruins of the Roman Amphitheatre (231 feet long by 132 wide); the Altar of Hiero II. (640 feet by 25); the Latomia del Paradiso, with the 'Ear of Dionysius,' a rock-hewn grotto 210 feet deep, 74 high, and 15-35 wide; the Greek Theatre (480-406 B.C.), 495 feet in diameter, and the fort Euryalus (Mongibellini), all in the W. part; and in the E. the campanile of Sta. Lucia (11th c.); the Latomia de Capuccini, where languished the 7000 Athenian captives of the Sicilian Expedition (413 B.C.); the ruins of the church of S. Giovanni, and the Catacombs, extending in several stories to a total length of 9 miles. To the S.W., on the Anapo, are the mutilated columns of the famous Olympeium.—S. was founded in 734 B C. by Dorians under Archias. The colony rapidly increased, and from the time of Gelon (q. v.), who changed its aristocratic government into a *tyrannis*, and defeated Carthage at Himera (480), it was the chief city of Sicily. After Hiero I. (q. v.) and Thrasybulus it became (466) a democratic republic, which strove for the hegemony of the Sicilian cities, and broke the Athenian power in 413 B.C. New attacks by Carthage called Dionysius (q. v.) to the head of affairs (405), whom Dionysius the Younger (q. v.) succeeded (369). After him the democratic party prevailed (343), but was put down by Agathocles (q. v.). Under Hiero II. (q. v.) S. was an ally of Rome in the first Punic War. His grandson Hieronymus (murdered 213), joining Carthage, occasioned the great siege of S. by the Romans, which all the skill of Archimedes (q. v.) could not save from capture in 212 B.C. S. was taken by Belisarius in 535 A.D., by the Saracens in 878, and by the Normans in 1085. In 1865 it was made the capital of the province of S. See Cavallari, *Zur Topographie von S.* (1845); Baedeker's *South Italy, Sicily, &c.* (6th ed. 1877).

Syr'acuse, a city of the State of New York, U.S., on the Erie Canal and New York Central Railroad, 150 miles W. of Albany. It has 44 churches, a university, 20 schools, and 3 daily and 9 weekly newspapers. The State Idiot Asylum and a large State Armoury are situated at S. It has the largest salt-works in America, producing annually from 7,000,000 to 8,000,000 bushels of salt. There are also manufactures of hardware, machines, and agricultural implements, carriages, &c. Pop. (1870) 43,051, estimated (1876) at 54,000.

Syr'ia (Turk. *Suristan*, Arab. *Es-shan*), a vilayet of Asiatic Turkey, extends along the Mediterranean from the Gulf of Eskanderum to El-Arish, on the Egyptian frontier. It stretches inland as far E. as the Euphrates, and passes gradually in the E. and S. into the Arabian desert. The district of Lebanon (q. v.) was placed under a separate governor in 1861, and that of Palestine (q. v.) under the central government of Constantinople in 1873. S., therefore, comprises now only the seven sandjaks of Damascus, Beyrout, Acre, Belka, Hauran, Hamah, and Tripoli, with a pop. estimated (1877) at 1,100,000, including the resident Arabs and Beduins in the E., who number 100,000. The pop. of S. proper is about 2,000,000, and the area 146,000 sq. miles. S. consists of a seaboard of from 10 to 15 miles broad, and beyond the coast-ranges, of an interior comprising three areas of continental drainage—viz., that of Aleppo, that of Damascus, and that of the Jordan valley (*El Ghur*), the last, which is the largest, sinking far below the sea-level, at Merom to 120 feet, in the Sea of Galilee to 620, and in the Dead Sea to 1312 feet. The limestone mass of Lebanon forms two parallel ranges, or rather groups of ranges, Libanus and Anti-Libanus, the latter and more easterly containing the headwaters of the Jordan (q. v.). Between them lies the valley of the Cœle-S. (q. v.), whence the Orontes flows N. and the Leontes S. The highest point, Jebel Timarun, in Libanus (10,533 feet), is covered with all but perpetual snow. Some forty small streams descend to the Mediterranean, but most of these are dry in summer. Various parts of S. are markedly volcanic, and earthquakes frequently occur; Safed was terribly devastated in 1837, and Antioch in 1872. The so-called 'Syrian Desert' in winter is covered with coarse grass, and attracts not only antelopes, wild asses and boars, but Beduins with their flocks and herds. The climate of S. is generally hot and dry; summer rains are rare, while along the coast and in El Ghur the temperature often rises above 100° F. Though some of the grand old forests have disappeared, the mountain sides are still in many places clad with fine cedars, pines, and firs. Wheat, barley, and beans are the common cereals, but other products are rice, dhurra, pease, and lentils. Cotton, tobacco, silk, hemp, madder, indigo, capsicum, olives (for oil), and fine fruits are cultivated extensively. Of minerals, some coal is found in the S., abundance of salt, bitumen, sulphur, &c., in El Ghur, and a little iron in Lebanon. The only manufactures, besides coarse articles for home use, are fine silks, gold and silver thread stuffs, carpets and arms. In the opinion of several recent travellers S. is capable of great development under better government. In 1876-77 the estimated revenue of S. amounted to £526,734, and the expenditure to £526,772. Damascus has always been the chief city. Other places are Beyrout, Tripoli, Latakia, Hamah, and Jafa. The Maronites (q. v.) of the hill-country between Lebanon and the sea have belonged to the Latin Church since the 12th c., and number 200,000. Between them and the semi-heathen Druses (q. v.), about 50,000 strong, there is a deadly feud, which often breaks forth, as in 1860, in scenes of violence. Although the Turk rules, the Semitic race prevails. Syriac has all but given place to Arabic, and Greek is freely spoken in the ports. S. was a prosperous and populous land long before its conquest by the Hebrews under David, who seem merely to have made its princes tributary. Together with Palestine S. was joined successively to the empires of Assyria, Babylonia, Media, Persia, and Macedonia. The Greeks here formed the flourishing empire of the Seleucidæ (q. v.). Pompey made it a Roman province (69-64 A.D.), and on the division of the empire it fell to Byzantium. In 632 it was overrun by the Arabs, and from about 661, when Damascus was made the capital of the Mohammedan empire, Antioch (q. v.) began to decay. The dominion of the Crusaders (q. v.) was of short duration, for in 1291 the Mameluke rulers of Egypt drove out the knights, and the subsequent invasion of Tamerlane left the country a wilderness. In 1517 Selim I. conquered S., which still forms part of the Turkish empire. Religious bigotry and oppressive taxation have gained S. an evil distinction even within the dominion of the Porte, and the first act under the Anglo-Turkish Convention introducing reforms into Asia Minor was the appointment (December 1878) of Midhat Pasha as governor-general of S. for a fixed period of twelve years. The construction of the Euphrates Valley railway will bring the country directly under the influence of Western Europe. See Wortabet, *S. and the Syrians* (2 vols. 1856); Cooper, *Sects in S.* (1860); Porter, *S.'s Holy Places* (new ed. 1867), and *Giant Cities of S.* (1869); Burton and Drake, *Visits to Unexplored S.* (2 vols. 1872); Isabel Burton, *Inner Life of S.* (2 vols. 1875); the Handbooks of Murray (new ed. 1875) and Baedeker (1875); Bogué, *Syrie Centrale; Architecture Civile et Religieuse du I. au VI. Siècle* (Par. 1869-77) and *Inscriptions Semitiques de la Syrie* (Par. 1869-77); and Käït Bey, *Travels in Palestine and S.* (1878).

Syr'iac Language and Literature.—The Syriac language belongs to the Northern or Aramaic branch of the Semitic Languages (q. v.). In the 1st c. A.D. it was developed by Christians into a written language, but from that time it was gradually supplanted by Arabic, and it now exists only in the corrupt dialects about the lakes Urmiah and Van, kept alive by the

efforts of missionaries. The best grammar of this 'modern S.' is by Nöldeke (Leip. 1868). From the Syriac chirography, which in its oldest form, the 'Estrangelo,' was once widely diffused in Asia Minor, were derived not only the Kufic Writing (q. v.) of the Arabs (from which the Arabic, Persian, and Turkish alphabets have sprung), and the Zend and Pehlevi writing of the Iranians of the time of the Sassanidæ, but also through the medium of the Nestorians (q. v.), the chirography of the Ugrians, Mongols, Kalmuks, and Mantchus. The extant Syriac literature is almost exclusively Christian, composed after Greek models, and containing many words of Greek origin. Its oldest classic specimen is the Peshito (q. v.). Its poetry wholly consisted of unrhymed hymns, of which the chief writers were Bardesanes (q. v.) and his son Harmonius. The golden age of Syriac literature dates from Jacobus, Bishop of Nisibis (died A.D. 350) to Ibas, Bishop of Edessa (died A.D. 470), the great schools of which two cities were, down to the Middle Ages, the centres of Syriac learning. The greatest writer of this period was Ephraem Syrus (q. v.). From the 4th c. Syriac literature is mainly translations of Greek philosophical and scientific works, which formed the basis of the Arabian writings of the 8th and 9th centuries, that through Spain carried Eastern learning to Western Christendom. From the 10th c. it declined, and in the 13th its last great writer was Bar-Hebræus (see ABULFARAJ). The chief collections of Syriac MSS. are in the Vatican, the Bibliothèque Nationale, the Bodleian, and the British Museum. The best Syriac grammars are by Uhlemann (2d ed. Berl. 1857); Hoffmann (2d ed. by Merx, 1867-70); the best Syriac chrestomathies (with vocabularies) by Bernstein and Kirsch (2 vols. Lond. 1867); Rödiger (2d ed. Halle 1868), and Martin (Par. 1875). A comprehensive *Thesaurus Syriacus*, embodying the incomplete works of Quatremère, Bernstein, Lorsbach, Ernesti, and Field, is preparing by R. Payne Smith, S.T.P.R. (Fasc. i.-iv., Clar. Press, Oxf. 1868-77).

Syr'iac Ver'sions. These, given in the order of their probable antiquity, are the following:—1, *Curetonian* (middle of 2d c.?) fragments of the Gospels contained in one of Tattam's Nitrian MSS., and first published by Dr. W. Cureton in 1858. 2, *Peshito* (end of 2d c.?), a revised text of both Old and New Testaments, possibly based on (1), though the relation of the two is still subject of controversy among scholars. 3, *Philoxenian* (A. D. 508), a version of New Testament made at the instance of Philoxenus, Bishop of Hierapolis. The discovery of a MS. at Beyrout containing the gospels in this version, and the remainder of the New Testament in (2), was announced by Hall in August 1877. 4, *Harclean* (616), a revision of (3) made by Thomas of Harkel, with valuable marginal readings. 5, *Hexaplar*, made (617) from Origen's version of LXX. 6, *Jerusalem Syriac* (5th c.?), found only in a Vatican MS. recently edited by Erizzo. 7, *Karkaphensicn*, contained in a little-known Vatican MS., but apparently resembling (2). The most accessible edition of the Peshito is Bagster's Polyglott, the rest are best consulted in Adler's *Novi Testamenti Versiones Syriacæ* (Copenh. 1789).

Syr'ian Rite, Church of the, is composed of those Christians in Syria who use the Syriac Liturgy of St. James. This liturgy was originally composed for the Patriarchate of Antioch, which included the churches of Palestine and Mesopotamia, and according to tradition by the Apostle James. There is no Greek MS. of it in existence of an earlier date than the 10th c., but the Syriac Liturgy of the same name almost exactly answers the description given of it in various writers. After the Mohammedan conquest (638) the orthodox Syrians were drawn into closer association with the Patriarchate of Constantinople, and then adopted the Liturgy of St. Chrysostom, which was used by the rest of the Eastern Church. By the orthodox Greek Church of Jerusalem, then, the Liturgy of St. James is used in the Greek form only once a year, namely, on the Festival of St. James. But it is still used in its Syriac form by the Monophysites or Jacobites (q. v.), as well as by the Maronites (q. v.). The latter renounced the Monothelite heresy (1182), and entered into communion with the Church of Rome, to which they were formally reunited at the Council of Florence (1445); but notwithstanding this union they have always retained a kind of independence, and especially their own liturgical customs. A Maronite college was founded at Rome, 1584, for the education of their clergy, where worship is conducted according to the S. R. See Etheridge, *Syrian Churches* (Lond. 1846); Assemanni, *Bibliotheca Orientalis* (Romæ 1687-1768); Neale, *Hist. of the Holy Eastern Church* (Lond. 1873).

Syringe', a form of pump, consists of a cylindrical tube, in which a piston works as nearly air-tight as possible. Water or other liquid is first sucked by retraction of the piston, and then forcibly expelled by the return stroke. In the *condensing* S., a form of air-pump, the piston has a valve opening inwards, so that the air which enters during the back stroke may be compressed into a vessel with which the S. is in connection.

Syrrhap'tes, a genus of birds belonging to the order *Rasores* (q. v.), and to the Grouse family (*Tetraonidæ*). *S. Pallasii* is the familiar species, inhabiting Central Asia, near Lake Baikal. Pallas termed this bird *Tetrao paradoxus*. The legs are short and feathered, and the toes united through the greater part of their length. The flight is stronger than in Rasorial birds generally.

Syr'tis Ma'jor and Min'or, the names applied by the Greek geographers to two gulfs on the northern coast of Africa, the modern Gulfs of Sidra and Khabes. So called from the sandy desert (Sem. *sert*) which fringed the shores, they were feared by the coast-hugging sailors of antiquity for their shallows and sunken rocks.

Syr'up (from the Sem. root *Srb*, through the Latin). The ordinary or golden S. of shops consists of the uncrystallisable residue finally separated from crystallised sugar in the process of refining, either by the draining of sugar in loaves, or forcibly ejected by the centrifugal apparatus in preparing moist sugar. In the sugar manufacture, however, the term S. is applied to all strong saccharine solutions which contain sugar in a condition capable of crystallising out, and the ultimate uncrystallisable fluid is distinguished as molasses or treacle. In pharmacy simple S. (*Syrupus simplex*) is a saturated solution of pure sugar, and a numerous class of medicinal preparations are in use, which, under the name of syrups, consist of that substance with the special therapeutic agent or compound added to it.

Syzran', a town of Russia, government of Simbirsk, on the Volga, 148 miles E. of Penza by rail. It is the centre of a rich agricultural district, and has a large river trade in corn. Pop. (*St. Petersb. Cal.* 1878) 19,443.

Sy'zygy, in astronomy, occurs when the sun, moon, and earth are in one line, so that when the moon is new or full it is said to be in S.

Szarvas', a town of Hungary, on the Körös, a tributary of the Theiss, about 90 miles S.E. of Pesth. It lies in the centre of a swampy district. Bee-keeping is one of the principal industries of the inhabitants. Pop. (1870) 18,917.

Szathmar'-Nemeth'e, a town of Hungary, lying on both sides of the Szamos, 64 miles E.N.E. of Debreczin by rail. It manufactures earthenware, canvas, and slibowiz, a kind of brandy distilled from plums. Pop. (1870) 18,353.

Sze-Chuen ('Four Streams'), a large province in the W. of China, bounded N. by the Kin-Long-Shan Mountains, E. by the Snowy Mountains, S. by Yunnan and Quei-Chu, and W. by Hu-nan and Hu-he. It is watered by the Yang-tse-Kiang (here known as the Kin-Sha-Kiang) and its numerous tributaries, is indifferently fertile, but has some metallic wealth. Area 185,053 sq. miles; pop. estimated at 35,000,000.

Szeg'edin, an imperial free-town of Hungary, at the confluence of the Maros and the Theiss, 171 miles S.E. of Pesth by rail. It is composed of the town proper and five suburbs, and is strongly fortified. The most important buildings are the Greek Oriental church of the Franciscans, the town-house, and the great salt magazine. There are several monasteries, a gymnasium, a real-schule, a theatre, &c. S. has manufactures of soap, tobacco, cloths, &c., the largest wharves on the Theiss, and carries on a great trade in agricultural produce with Transylvania and the Banat. Pop. (1870) 70,179.

Szentes', a town of Hungary, near the Theiss, 29 miles N.N.E. of Szegedin, with a large export of wine. Pop. (1870) 27,658.

Szolnok', a town of Hungary, on the Theiss, 64 miles E.S.E. of Pesth by rail, with trade in wood, salt, and fruits. Pop. (1870) 15,847.

T.



the twentieth letter of the English alphabet, derived through the Latin from the Semitic and Greek Tau, and exceptionally constant both in character and pronunciation. It is a thin or sharp dental, closely allied to TH (which is properly a letter by itself), D and Z. Its chief irregularity of pronunciation in English is when it is followed by I and another vowel, as in 'militia,' where it takes the soft sound of C, according to the usage of post-classical Latin. Its common interchanges are with one or other of its cognates mentioned above, and with S. Thus Latin *tu* = Greek *su*; German *du* = English 'thou *y*' Latin *pater* becomes *padre* in Italian and Spanish; Latin *natio* becomes *nazione* in Italian; English 'ten' is Latin *decem* and German *zehn*. Under this letter may be mentioned the double consonant TH, which is a mere variation of T. In English it has two distinct sounds, the one soft as in 'thing,' the other hard as in 'that.' The former of these two is its proper phonetic value, representing the Greek Theta and the Semitic Teth. The latter is almost peculiar to English, and forms a great stumbling-block to foreigners. The modern Greeks, however, pronounce their D in the same way. In French and in German TH has come to be pronounced merely as a hard T; *cf.* our 'Thomas;' in recent German printing there is a tendency to omit the unsounded H. As an abbreviation in Latin T. stands for Titus, but Ti. for Tiberius.

Taba'nus, a genus of *Diptera* (q. v.) or Flies including the gad-flies, clegs, &c. The *T. bovinus*, or Large Gad-fly, is a familiar species, which greatly irritates cattle. These flies abound in spring and summer. Their proboscis is esserted, and the antennæ are 3-jointed. In tropical countries the species of this genus attain their largest size.

Tabard (Low Lat. *tabardum*), a kind of tunic worn over armour in the 15th and the 16th c. Reaching to the loins, but open at the sides, it was embroidered with the arms of the wearer or of his lord, and is still the official dress of heralds, who bear the armorial ensigns of their sovereigns.

Tabb'y (Fr. *tabis*), the name of a silk or other stuff having a wavy or 'watered' appearance produced by pressure between engraved rollers, a mode of calendering called *tabbying*.

Tab'ernacle, of the Congregation (Lat. Vulg. *Tabernaculum fœderis*; Heb. 'a tent, a dwelling'), described in the Book of Exodus (xxv.–xxxix.) as erected by the Israelites during their sojourn at Sinai, on the way from Egypt to Canaan, was an oblong tent 30 cubits (about 55 feet) long by 10 (about 18 feet) in width and 10 in height, standing lengthwise E. and W. The framework of the structure was composed of upright acacia boards, gilded on the inside, and held together by bars of the same material, which passed through rings of gold fastened in the boards. The roof of the tent was composed of curtains stretched across this framework. The innermost, the material of which was byssus, displaying the four colours, blue, purple, scarlet, and grey, and images of cherubim, so as to be symbolical of God descending from heaven (*cf.* Ezek. i. 4–28), was composed of ten small ones. Over this curtain were stretched other three: one of goats'-hair cloth, one of rams' skins dyed red, and the fourth of badgers' (dolphins'?) skins. The eastern end or entrance was closed by a curtain stretched on five pillars, and at the distance of 10 cubits from the western end, another curtain, of the same material as the ceiling-curtain, was suspended on four pillars, so as to divide the sanctuary into two apartments. The inner apartment, or 'Holy of Holies,' contained the Ark of the Covenant (q. v.), the two tables of the Law (Exod. xxv. 16), Aaron's rod which budded (Numb. xvii. 10), and a pot of manna (Exod. xvi. 33, 34); *cf.* Heb. ix. 4, where the latter articles are spoken of as *in* the Ark. The outer apartment, or Holy Place, contained, in the middle, the golden altar of incense, in the N.W. corner the table of show-bread, and in the S.W. corner a seven-branched lampstand (Exod. xxv. 23–40; xxx. 1–10; xxxvii. 25–29; Lev. xxiv. 5–9). The T. stood in an enclosure 100 cubits long by 50 wide (formed by curtains suspended on pillars 5 cubits high), 20 cubits from either side and the west end, so as to leave a clear square of 50 cubits at the east end. Near the entrance of this court, which was also in the east end, stood the brazen altar of burnt-offering, and between it and the T., the laver for the ablutions of the priests (Ex. xxvii. 1–19, xxxviii. 1–8).

Tab'ernacles, Feast of, was the great autumn festiva among the Israelites, corresponding to the Passover or spring festival, and was celebrated from the 15th to the 22d Tishri (September), or after all the crops of the year—both grain and fruit—were gathered in; hence its name 'Feast of Ingathering' (Ex. xxiii. 16). In the earliest times, the people marched out in procession to the open fields, bearing ripe fruits and branches of trees, and there built arbours in which they dwelt during a certain period of rest and rejoicing (Lev. xxiii. 40–42), from which the festival received its name F. of T. The sacrifices appointed for the festival consisted of thirteen bullocks (on the first day, diminishing by one to seven on the last), two rams, fourteen lambs, and a goat, with meat- and drink-offerings (Num. xxix). After the Captivity the processions to the fields were abandoned, but booths were set up on the roofs of the houses, in the market-places, &c. (Neh. viii. 15–18). In the Temple special ceremonies were performed on the occasion. On the morning of the 15th, the great ceremony was the drawing of water by a priest from the pool of Siloam, to be poured on the altar along with so much wine. While this was being done the people brought willows to decorate the altar. On the evening of the 15th and five succeeding nights the people in the court of the Temple celebrated the rejoicing of the drawing of water by the light of four great candelabras and many torches (*cf.* John viii. 32). With the exception of the ordinances, which only applied to the Temple, and the adaptation of some of the rites to their altered circumstances, the Jews still continue to celebrate the F. of T. in the same way as before the dispersion.

Ta'bes Dorsa'lis is a disease of the spinal cord, called by some physicians *Posterior Spinal Sclerosis*. The earliest symptoms are darting pains from the feet up the legs and thighs, the pains being most severe at night and in damp, cold weather. They appear and disappear rapidly, and move suddenly from one place to another. After a time peculiar sensations are experienced in the feet. When walking the patient complains that the ground feels as if it were covered by fur or a padded cushion, or as if the shoes were filled with sand, or as if he were walking in the air. In general there is neither loss of muscular power nor sensation, but only a perversion of tactile sensibility, and that only limited to the sense of contact. Awkwardness of gait is an early symptom; the feet fly out and are planted with a kind of jerk, the heel touching the ground first; and the individual totters, and is eventually unable to walk at all without support. The disease may last from five to twenty years. Atrophy of all the muscles of the extremities generally takes place towards the end of the disease, and bed-sores and arthritic troubles are the painful forerunners of death. Professor Erb of Heidelberg first described about three years ago a new form of spinal disease

which he called spasmodic spinal paralysis, and which Professor Charcot, in the latest fasciculus of his work on the *Diseases of the Nervous System*, speaks of as T. D. *spasmodique*. This disease appears to be one which is by no means uncommon, the essential features being loss of power associated with spastic rigidity of the paralysed muscles, without modification of sensations or of the functions of the bladder. The chief causes of T. D. are dissipation, onanism, venereal excess, syphilis, injury, and exposure to rain and cold.

Tab'inet, a kind of Poplin (q. v.), used for window curtains, &c.

Ta'ble-Lands, or **Plateaux**, are elevated plains, such as those of Castile and Leon in Spain (from 2000 to 3000 feet), of Quito in Mexico (10,000 feet), of Desaguadero in the Andes (13,000 feet), the Oregon Territory and the great salt plain in the United States, and the Pamir Plateaux of Central Asia.

Ta'ble-Money, allowances granted to leading military and naval officers in special localities to cover the expenses of hospitality. They seldom exceed £3, 3s. per day.

Ta'ble Mountain, a prominent height in the S.W. of Cape Colony, overlooking Cape Town, is a rugged granite mass, 3600 feet high. It is flat-topped, and the phenomenon of the 'tablecloth' is due to a difference of 13° in the temperature of summit and base. In summer a S.E. blast, after sweeping the level top, sends the mist down the precipices on the N. side like drapery; but this drapery never descends beneath a certain level, for it is dispelled on coming in contact with warmer air.

Ta'bles, in mathematical science, pure or applied, are lists of numbers giving the values of a function of a variable for different values of that variable. The function may be a physical property common to different substances, as in T. of densities, specific heats, &c.; or it may be a mathematical function of a continuously varying variable tabulated for definite successive values of that variable, as in T. of logarithms, sines, tangents, and astronomical T. generally.

Ta'ble-Turning. See SPIRITUALISM.

Ta'bor, or **Ta'bour**, a musical instrument resembling a tambourine, but without jingles. It was used in old times in England to accompany the morris dance, being slung round the neck and beaten with a stick.

Ta'bor, Mount (mod. *Jebel el Tur*), stands by itself on the N.E. border of the plain of Esdraelon (q. v.). It is remarkable for the symmetry of its form, which resembles a truncated cone, from certain points appearing almost hemispherical. The top measures about half a mile across, and is about 1300 feet above the level of the plain. T., which is now crowned by a confused mass of broken walls, towers, &c., has a history extending from the invasion of Canaan by the Israelites (Josh. xix. 12, 22; Judg. iv.) down to the present time. It is not mentioned in the New Testament, but there is a tradition that it was the scene of the Transfiguration. This, however, is rendered impossible by the town on the top.

Ta'borites. See HUSSITES.

Tabriz' (anc. *Taurus*, 'the mountain-town'), one of the principal cities of Persia and capital of the province of Azerbijan, is situated 320 miles S.S.E. of Tiflis, at a height of 4500 feet above the sea, on the left bank of the Ajichai, and at the W. extremity of a wide plain, which is bounded on the S.W. by Lake Urumia, and surrounded on the other sides by barren ranges of red sandstone hills. T. is surrounded by a double wall of sunburnt bricks, and is divided into eight quarters, each of which has a gate. The principal edifice is the Ark Ali Shah, 80 feet in height. T. has twelve public baths, many excellent bazaars and caravanserais, and a spacious British consulate. Its present importance depends on its being the principal emporium through which the trade between Persia and Western Europe passes. Goods are conveyed by caravan to Trebizond and to Tiflis, thence by rail to Poti. In 1877-78 the value of exports (chiefly coloured cottons, shawls, silks, carpets, tobacco, drugs, dyes, and dried fruits) and of imports together amounted to £796,400, as against £1,707,389 in 1873-74, a falling off due to the Russo-Turkish war. Pop. estimated at 50,000. The Russian government has arranged to extend as soon as possible the Poti-Tiflis railway to Teheran, *via* T. and Kasbin, according to a despatch of January 1879.

Tabu', more correctly **Tapu'**, a Polynesian word denoting an institution which was formerly in existence throughout Polynesia and New Zealand, but has now to a large extent disappeared before the spread of Christianity and civilisation. The word signifies something set apart, either as consecrated or accursed, the idea of prohibition being conveyed in either case, whence the English word, *tabooed*, *i.e.*, forbidden. For example, in New Zealand the person of a chief was strictly *tapu*, and hence might not be touched; while the volcano Tongariro was *tapu* as being the supposed residence of demons, and even to look upon it was at one time forbidden. The system seems to have had its origin in a superstitious dread of the unseen powers of evil, and the chiefs, quick to perceive the power which it would place in their hands, appear to have adopted it from remote times as a political engine, the priests readily co-operating with them for the sake of the influence which it gave them likewise. The chiefs were themselves amenable to the regulations of the T., but in a much less degree than their subjects, and possessed a wide discretionary power, which was limited only by precedent, of declaring objects to be T. The T. could be removed only by the person by whom it was imposed, or by one greatly his superior in rank, but courtesy usually kept the latter power in abeyance. So potent was the superstition, that Scherzer states that among the Maories even hostile tribes were in the habit of leaving unharmed all persons and things protected by the T.

Tacahout', or **Tacout'**, the name for small, irregularly-rounded, tuberculate galls produced by a species of *Cynips* on the twigs of a *Tamarix* (probably *T. articulata*) in Algeria and Morocco. They contain a large quantity of gallic acid, and are imported for use principally in photographic preparations. The above-named species of *Tamarix*, as also *T. gallica* and *T. dioica*, supply a similar gall in India—the Mahi of the Punjaub and Sakun of Sindh—which is collected for sale and used as a mordant in dyeing and in tanning.

Tac'amahac, or **Tacamaha'ca**, a balsamic bitter resin obtained from several species of *Calophyllum*, natives of the E. and W. tropics. *Icica tomentosum* and *Elaphrium T.* (both belonging to *Burseraceæ*) are also said to yield a commercial T. The leaf-buds of *Populus balsamifera* of N. America, called the T. poplar, are used to make an ointment, and to prevent rancidity in other ointments.

Tacc'a, a tropical genus of monocotyledonous herbs, some of whose species have a large tuberous root; *e.g.*, the *T. pinnatifida*, a plant of the shores of the South Sea Islands. Its tubers, which resemble new potatoes, contain a large proportion of starch, and this being separated by rasping and maceration, is largely used as an article of food. It bears the name of South Sea, Tahiti, and Fiji arrowroot, and Otaheiti salep, and is also esteemed as a medicinal agent in dysentery and diarrhœa.

Ta'cit Reloca'tion. See RELOCATION, TACIT.

Taciturn'ity is, in Scotch law, a mode of extinguishing an obligation by making no claim under it. Usually the law follows the periods of Prescription (q. v.) in applying the doctrine of T.

Ta'citus (1) **C. Cornelius**, the historian. The time and place of his birth are unknown, but it is conjectured from the expressions of the younger Pliny in his Epistles that the date was not later than A.D. 51 or 52. In 78 he married the daughter of Agricola, who had been betrothed to him the year before during the consulship of her father. This illustrious alliance probably furthered his public advancement, for at the beginning of his *Historiæ* he tells us that his elevation was 'begun by Vespasian, augmented by Titus, and still further advanced by Domitian;' and as Vespasian died June 23, 79, he probably was elected to the office of ædile early in that year, and to the tribuneship of the people under Titus in 80 or 81. We know from his own testimony that he was prætor, 88, in which year Domitian celebrated the Ludi Sæculares. He was absent from Rome together with his wife from 89 or 90 till after the death of Agricola, which took place August 23, 93, but it is certain that he was in Rome during the closing period of the reign of Domitian, who was assassinated September 18, 95. In 97, during the reign of Nerva, T. was appointed consul suffectus, in the place of Virginius Rufus, who had died within the year, and whose funeral oration he pronounced. 'Fortune,' says Pliny, 'reserved her last favour to him, that of being commemorated by the greatest of living orators.' In 100,

together with Pliny, he conducted the impeachment of Marius Priscus, proconsul of Africa. The date of his death is unknown, but he appears to have survived Trajan, who died 117. The extant works of T. are (1) the *Dialogus de Oratore*, probably his earliest work, sometimes ascribed to Quintilian or the younger Pliny; (2) the *Agricola*, the most perfect specimen of ancient biography, published 97; (3) the *Germania*, a description of the political institutions, the religion and the habits of the various tribes known as Germani; (4) the *Historiæ*, the first 4 books of which are extant in complete form and a part of the 5th, comprehending the period from the second consulship of Galba, 68, to the death of Domitian, 96, written between 103 and 106; (5) the *Annales*, commencing with the death of Augustus, 14, and comprising the period to the death of Nero, 68, a space of fifty-four years. The greater part of the 5th book, the last, is lost, as well as the whole of the 7th, 8th, 9th, 10th, the beginning of the 11th and end of the 16th. We learn from St. Jerome that the *Annales* and *Historiæ* together contained 30 books, and related the events of about 70 years from the death of Augustus to the accession of Nerva. His original intention was to write the history of Nerva and Trajan, but he seems later to have abandoned this idea and to have had the intention of writing the history of the reign of Augustus. T. stands first among Roman writers in vividness of imagination, in insight into the intricacies of human character, and in the breadth and comprehensiveness of his historical faculty. A stern love of truth is everywhere visible. His *Annales* are filled with highly dramatic scenes, in which appear before the reader lurid figures, Titanic in their crimes, whose characters are portrayed with the most elaborate analysis. His style is in keeping with the prevailing mood of his mind—it is nervous, precipitate, often abrupt, always vigorous. He studied brevity and condensation, but by the highly diversified cadence of his periods and the wide compass of his vocabulary he strove to vary the monotonous record of imperial despotism. The best edition of his complete works is that by Orelli (2 vols. Zür. 1846-48). Excellent translations are those by Church and Brodribb—the *Historiæ* (Lond. 2d ed. 1873), *Annales* (ib. 1876), *Agricola* and *Germania* (ib. 1877).—(2) **M. Claudius**, Roman emperor, succeeded Aurelian, September 25, A.D. 275. He claimed a descent from the great historian, and ordered his works to be placed in all public libraries. Elected emperor at the age of seventy by the senate, he was persuaded with difficulty to accept the dignity. During his brief reign he endeavoured to repress the prevailing luxury by sumptuary laws, while he himself set an example of simplicity and virtue. His death took place at Tarsus or at Tyanum, April 9, 276.

Tack is the name applied to the windward clue of a fore-and-aft sail, or of a course also to the rope affixed to this clue for the purpose of hauling the sail (see SAIL).—*Tacking* is the method of navigation usually adopted by sailors when endeavouring to sail against the wind, and consists in beating to windward by a zigzag course. Tacking depends on the principle of the Composition and Resolution of Forces (q. v.). The portion of the wind resolved in the direction perpendicular to the sail has a resolved portion blowing in the desired direction. The sails are close-hauled, *i.e.*, braced to that amount of obliquity to the direction of the ship's keel necessary to make this useful resolved portion as great as possible. When the ship has sailed as far as may seem desirable before this wind, the helm is put about and her head is brought to the wind. At the same time the yards are 'hauled aback,' *i.e.*, swung at right angles to the direction of the keel, and then again braced obliquely to the keel, in the opposite direction to that which they formerly occupied. The ship proceeds before this wind till her head is again brought to the wind, and so on. When the wind blows on the starboard side the ship is said to be on the starboard T., when it blows on the port side she is on the port T.

Tack'ing of Mort'gages, in English law, is a mode of adding a postponed to a preferable mortgage, by which a preference over an intermediate mortgage is acquired for both. See MORTGAGE.

Tac'na, in full, **San Pedro de Tac'na**, a town of Southern Peru, in a fertile valley, 2000 feet above the sea, has a considerable trade. A railway 39 miles long connects it with the port of Arica (q. v.). Pop. 15,000.

Tac'tics, Mil'itary, the art of handling troops, and the skilful use of military resources, on the field of battle or in the face of the enemy. *Elementary tactics* consist of methods of drill and minor tactical formation. *Grand Tactics* deal with the manipulation of large bodies of troops in action, with the view to be the stronger at a decisive point, notwithstanding any inferiority of numbers along the whole line.

For tactical purposes, the army is divided into infantry, cavalry, and artillery, and these branches are respectively subdivided into battalions, squadrons, and batteries. Battles are defensive when an army awaits in a selected position the attack of the enemy, offensive when an attack is made upon the enemy's position, and mixed when both armies are advancing and suddenly confront each other. In general tactics, remaining on the defensive is not advisable, and on a protracted scale is a sure sign of weakness. Where it is possible to choose the ground for a battle, the position should be so selected that any advantage which the enemy possesses may be neutralised as far as possible, and that any arm in which the army is stronger than the enemy may be effectually employed. It should also be favourable to observing the movements of the enemy, while it obscures the movements of the general's own troops. With the beginning of an engagement, the individuality of the general asserts itself. The main features of the campaign may have been sketched previously, but in the actual conflict a thousand incidents and accidents call for his personal attention, and success or failure often hangs upon his skill, determination, and resource in dealing with them. The disposition given to the troops for a manœuvre in action is called an order of battle. The order may be parallel, oblique, perpendicular, concave, convex, in echelon, or a combination of these.

Infantry and *cavalry* may be employed in extended order or thin lines, in lines of battalion columns, in deep columns, or in squares or other formations. The greatest difference has existed in the history of war as to the depth of lines of battle. In ancient warfare these lines became gradually more slender, diminishing from the Greek method of nearly twenty ranks to the depth of six ranks used by the later Roman legions. In modern warfare, owing to improvements in range, accuracy, and rapidity of fire, this has been still further diminished. The general infantry formation now is a first line of skirmishers, a second line, and a reserve. A deep column should never be formed within range of the enemy's artillery, and is only useful for bursting through the enemy's line. If a column breaks the opposing line they deploy right and left, rolling up the enemy's flanks, while cavalry and fresh bodies of infantry pour in through the gaps. The old defensive formation of the square may almost be considered a thing of the past. The main objection which can be taken to extended orders of battle is their immobility. Pushed to the extreme, open order constitutes every man a tactical unit, a state of affairs only desirable when the average intelligence of each soldier is very high.

Cavalry is a body which does not enter greatly into tactics, as although useful for reconnoitring, for harassing a defeated and disorganised enemy, and for various *strategical* military operations, its duties are not so important on the battle-field. While infantry is an effectual force both by fire and impulsion, cavalry is effective only as regards the latter, and can seldom break through a well-armed body of infantry, though effective in fleeting moments of attack. Long lines are seldom used in cavalry attacks on troops, which are usually made in open column or in echelon. In cavalry attacks on batteries a formation in skirmishing order is probably best.

Artillery tactics should be such as to clear a path for the other branches of the service. The position of the guns and their distance from one another on the field of battle depend altogether on the nature of the ground. As guns frequently fire over the heads of their own infantry, a tolerably high position is often required, but a very elevated position is in most cases of advantage to the enemy. The position should be favourable either for advance or retreat. Every avenue of approach should be commanded, and the flanks well protected. A frequent change of position is to be deprecated. In batteries, concentration of fire is the essential point to be gained; while enfilade fire by which the enemy is taken in flank is the most destructive method on the field. As infantry fire does no harm to the guns but only to men and horses, as many available guns as possible should be brought into play, while part of the available men and horses

should form a reserve. It is common in the British army for each waggon to follow its own gun. In the German army all the guns go first, then the waggons. Field artillery should only fire at a good range, say on open ground at 4000 yards, which prevents column formation.

In the wars of Napoleon artillery tactics assumed great prominence. In that between France and Austria in 1859 the artillery decided the battle of Solferino. The Austro-Prussian war of 1866 proved the immense value of the breech-loading rifle. In that struggle the artillery was not prominent, the Prussian artillery being too much in the rear, while the Austrian was not well served. In the great war of 1870 artillery came, however, again to the front. The Germans at the beginning of an engagement sent all their available guns into action, and under a concentrated artillery fire carried on their infantry attacks and flanking movements. The recent Russo-Turkish war conveys few lessons of artillery tactics, as the Turks never attempted fighting in the open, and the Russian artillery was not first class. See Hamley's *Operations of War Explained and Illustrated*, and the works of Jomini, Marmont, Napier, Moltke, &c.; also Taubert's work *On the Use of Field Artillery*, translated by Colonel H. H. Maxwell; Lieut.-Col. Middleton's *Changes of Tactics consequent on the Improvement of Weapons* (1873), and *Lecture on Artillery Tactics*, delivered by Colonel Brackenbury at the Royal United Service Institution 1876.

Tac'tics, Naval, the art of bringing ships of war into action, and of handling them in the presence of the enemy. N. T. have greatly varied from time to time according to the means of propulsion and the armament of vessels. Up to the battle of Lepanto in 1571, when naval combats were chiefly confined to the placid waters of the Mediterranean, war-ships were propelled by oars, and battles were conducted on the same principle as those of the ancients; that is to say, they consisted of ramming and hand-to-hand struggles, the vessels being drawn up 'line abreast,' with their rams to the enemy. The early Greeks had great faith in ramming, and manœuvred so as to gain the weather-gage, and thus increase the force of their attacks. Subsequently grappling with the enemy and boarding her came into favour. The galley was in the Middle Ages for a long time the unquestioned type of a perfect ship of war. The order of battle was usually crescent-shaped, and the guns were so mounted on the galleys as to deliver a destructive bow-fire. From the date of the battle of Lepanto to that of Lissa in 1866, when the wind was the means of propulsion, and vessels carried their armaments in their broadsides, 'line ahead' was the formation of battle, in order to present the broadside to the enemy. James II. was the originator of the tactics which for a long time characterised the English navy, and the class of ships in use at his time differed little from our men-of-war of twenty years ago. Paul la Hoste published his *L'Art des Armées Navales* at Lyon in 1697, the study of which made French naval officers superior to English tacticians during the 18th c. They profited by the weakness of the British constantly striving after the weather-gage, at whatever loss and in whatever circumstances. In 1782, John Clerk of Eldin printed his famous *Essay on N. T.* The two great tactical manœuvres advocated by him were *doubling on the enemy's rear* and *cutting the enemy's line*, according to principles clearly and minutely explained. They were put into operation with brilliant effect by Lord Rodney on the 16th April of the same year, in the action off Dominica. Our glorious victories in the wars with revolutionary France were won by these tactics, as well as great courage. Nelson was a disciple of Clerk of Eldin, and his surpassing qualities as a tactician were as remarkable as his dazzling gallantry. For modern ironclads, rams, and torpedoes, the formation of 'line ahead' is most suitable. Sir Howard Douglas suggests *oblique echelon* for attack. No great battles have yet been fought between ironclad fleets. The American war, the battle of Lissa, and the Russo-Turkish war teach us little but the power of ramming. Instead of close actions, battles will in future probably be fought at long ranges, and thus the practical effect of rams and torpedoes is doubtful yet. An unceasing vigilance must be maintained by the Admiral of the fleet to guard his ships against submarine attacks. (See TORPEDO.) The present is, however, a time of transition in N. T., and the true method of conducting a naval battle may be considered *sub judice*. The strength of the guns of modern ships of war is enormous, the guns of the *Inflexible* being 81 tons weight, while two vessels in the Italian navy are armed with 100-ton guns. There is no armour afloat that could resist such ordnance.

A large fleet is divided into squadrons, each consisting of at least four vessels. The Admiral-in-Chief commands the entire fleet, the admiral second in command the van (or right when in line), the third admiral the rear (or left in line), and the fourth admiral the centre. There are various orders or formations for navigating, entering and leaving port, anchoring, &c., practice in which constitutes elementary N. T. See Essay on the 'Past and Future of N. T.,' in No. 278 of the *Edinburgh Review*, October 1872, which contains a list of the best authorities on the subject.

Tade'ma, Laurenz Alma, an English artist of Frisian origin, born at Drouryp, W. Friesland, 8th January 1836. He devoted himself to the study of Roman and Egyptian antiquities at Leeuwarden, and completed his art education at Antwerp under Baron Leys. Made a member of the Academy of Amsterdam in 1862, he received a gold medal at Paris in 1864, a second-class medal at the Exposition of 1867, and a gold medal at Berlin in 1872. He settled permanently in London in 1870, and was appointed a member of the Water-Colour Society in 1873, and of the Berlin Academy in 1874. Among his principal works are 'The Grandchildren of Clotilde' (1861), 'How they Amused Themselves in Egypt 3000 Years ago' (1863), 'Catullus at Lesbia's' (1865), 'The Mummy' (1867), 'The Siesta' (1868), 'Pyrrhic Dance' (1869), 'Claudius Imperator' (1870), 'Last Egyptian Plague' (1872), 'Fishing' (1873), 'Autumn' and 'On the Steps of the Capitol' (1874), 'Sculpture Gallery' (1875), 'Audience at Agrippa's' and a 'Bacchanti' (1876), 'Seasons' and 'The Bath' (1877). Alike in water-colour and oil, T. is noted for the care and finish by which he contrives vividly to recall the ancient life of Egypt and Rome. His archæological accuracy is ably seconded by technical skill in rendering textures, draperies, and marbles. Although occasionally cold and conventional, his art at times, catching inspiration from the subject, glows with dramatic intensity.

Tad'mor. See PALMYRA.

Tad'pole. See FROG.

Tael, a Chinese money of account, equal to 10 *mace*, or 1000 *tseen* or cash, the sole current coin, and valued at 5s. 10d. sterling.

Tæ'nia and **Tæ'niadæ.** See TAPEWORM.

Tae'pings, the name of the rebels who desolated several of the richest provinces of China in the outbreak of 1850. See CHINESE EMPIRE.

Taff'ety, or **Taff'eta** (Pers. *taftah*, Ital. *taffeta*), a rich glossy silk stuff, plain or variously figured, of Oriental origin, and introduced into England as early as the 14th c. In Queen Elizabeth's time it was a favourite stuff for dresses.

Taff'rail, or Tafferel (Dutch, *taffereel*, Ger. *tafel*, 'a table'), the upper part of the stern of a ship, which is usually 'flat like a table.' Perhaps from a supposed connection with rail, it is also applied to the rail extending round the stern over the stern timbers.

Tafilet', or **Tafililelt'**, a division of the empire of Morocco, to which it has given the reigning dynasty. It has about 3000 fortified villages, and the chief place, Abuam, has a very large fair. Rain seldom falls, and the district is irrigated by water from subterranean streams. The dates of T. are well known in commerce.

Taganrog', a Russian seaport on the N.E. shore of the Sea of Azov, in the government of Jekaterinoslav. It has a citadel and harbour, the latter, however, too shallow to allow of large vessels lading at the quay, and various mechanical, educational, and industrial establishments. A life-boat association was founded here in 1872 by the Cesarevna, and has now four stations in the bay completely provided with apparatus. The foundation of a lighthouse, to be constructed on the most advanced scientific principles, was laid in the autumn of 1877 on the high table-land overlooking the T. mole. The principal exports are wheat, linseed, wool, and box-wood. Owing to the strict blockade of the Azov ports from the middle of May 1877, the returns of shipping and commerce for that year are far below the average; even in 1876 the total value of the exports was

£3,694,251, as against £5,602,704 for the previous year. Pop. (1870) 48,186. S. was founded by Peter the Great in 1696.

Taglio'ni, Maria, perhaps the most famous danseuse of the century, was the daughter of an Italian ballet-master of some note, **Filippo T.**, and was born at Stockholm, 23d April 1804. She appeared at Vienna in 1822, at Paris in 1827, and at London in 1838. One of her greatest successes was in her father's ballet, *The Sylphide*, in which she seemed to be borne by wings. She married the Comte Gilbert de Voisins and retired from the stage in 1847, living partly at Venice and partly at Lake Como. After the Franco-Prussian war, through which she had lost all her property, Madame T. came to London, where she gave lessons in deportment, and where she still (1878) resides. Her brother, **Paul T.**, born at Vienna in 1808, was ballet-master of the Royal Theatre, Berlin, and has composed many successful ballets, including *Flick and Flock* and *Satanella*.

Ta'gus (Sp. *Tajo*, from the Phœnician, 'river of fish'), the largest river in the Spanish Peninsula, rises in the Sierra Albarracin between Castile and Arragon, and flows W. by Toledo and Abrantes to Lisbon, where it enters the Atlantic by an estuary 20 miles long and in some places 5 broad. Its total length is 552 miles, over 115 of which it is navigable. The scenery along the T. is frequently imposing, particularly at Toledo, where it forces its way through a precipitous ravine 200 feet high. Its principal affluents are the Jarama, Alberche, and Zezere, from the N.

Tahi'ti (formerly written *Otaheite*), the largest of the Society group in the S. Pacific, is 32 miles long and 120 miles in circumference. The eastern portion is separated from the main island by an isthmus 2½ miles in width, and submerged at high tide. T. is mountainous, richly watered, and luxuriantly fertile. Its chief town is Papeete, which has a good harbour. In 1876 the imports into T. were officially valued at £130,000, and the exports (of which cotton, copra, pearl-shell, and oranges were the principal items) at £124,000. Pop. 14,000, of whom 1000 are Europeans and Chinese. See SOCIETY ISLANDS.

Tail and Tailzie. See ENTAIL.

Tail'or-Bird (*Orthotomus longicaudus*), a species of *Dentirostral*, found in India and E. Asia, and noted for its habit of weaving or sewing leaves together in the formation of its nest. The leaves of the tree are either joined together, or the nest may be ingeniously constructed of one large leaf. The bill is used in piercing holes, and the thread is formed by plant fibres.

Tai-Yuan', a town of China, capital of Shan-si, on the Fuen-Ho, an affluent of the Hoangho, 250 miles S.W. of Pekin. For many years the residence of the emperors, it is noted for its magnificent mausoleums. The chief manufactures are sword-blades and knives. Pop. estimated at 300,000, has been greatly reduced by the famine of 1875-78.

Tain (Norse, *Thing*, 'the place of assembly;' its Gaelic name is *Baile Duich*, 'St. Duthic's Town'), a royal Scottish burgh, county of Ross and Cromarty, on the S. shore of Dornoch Firth, 25 miles N.N.E. of Inverness by rail. It has a ruined chapel of the 13th c., a collegiate church of date 1471, an academy incorporated by royal charter, and a public hall erected at a cost of £2500 in 1876. There are some wool-carding, dyeing, and iron-founding, but the harbour has suffered from the silting common throughout the Dornoch Firth. Morich More, the famous golfing links, have been partly reclaimed for cultivation of late years. Pop. (1871) 2287.

Taine, Hippolyte Adolphe, a French author and critic, was born, 21st April 1828, at Vouziers (Ardennes), received his education at the Collége Bourbon and the École Normale, and devoted himself especially to philological pursuits. By his essays, *De Personis Platonicis* and *Sur les Fables de La Fontaine* (1st ed. 1853; 3d, 1860), he obtained the degree of docteur de lettres, and his *Essai sur Tite-Live* (1854; 2d ed. 1860) was crowned by the French Academy. Since then work after work has flowed from his pen—*Essais de Critique et d'Histoire* (1858; 3d ed. 1874), *Essais Nouveaux de Critique et d'Histoire* (1865), *Histoire de la Littérature Anglaise* (4 vols. 1864; 3d ed. 5 vols. 1873-74; Eng. trans. by Van Laun, Edin. 1871-72), *L'Idéalisme Anglais; Étude sur Carlyle* (1864), *La Fontaine et ses Fables*, a development of his former essay (1860), *Les Philosophes Français du XIXe Siècle* (1857), *Philosophie de l'Art en Italie* (1866), *Philosophie de l'Art en Grèce* (1869), *De l'Idéal dans l'Art* (1867), *De l'Intelligence* (1870; Eng. trans. by Haye, 1871), *Notes sur l'Angleterre* (1872), *Voyages aux Pyrénées* (5th ed. 1875), *Les Origines de la France Contemporaine, Tome I. L'Ancien Régime* (1875; Eng. trans. by Durant, 1876), *Tome II. La Revolution* (1878). In 1878 he was elected a member of the French Academy. As a writer, T. has attracted the notice of Europe by the brilliancy of his style, the boldness of his generalisations, and the vivacity of his arguments. In his historical researches he is as minute and painstaking as a very Dryasdust—ransacking contemporary documents and accumulating facts; but he sends through the fragmentary heaps the electric current of strong intellect and passion, and every atom is incorporated in a system which has the solidity if not the flexibility of life. In England the work which has attracted most attention is naturally the history of English literature; it is there that he emphasises what he regards as the three great factors of a national literature—the *race* of the people, their natural and social *environment*, and the *period* or duration.

Tait, Peter Guthrie, a Scottish mathematician and physicist, was born at Dalkeith, April 28, 1831. He was educated at the Edinburgh Academy, and after studying for one session at the University of Edinburgh, proceeded to St. Peter's College, Cambridge, where he graduated as Senior Wrangler and First Smith's Prizeman in 1852, and was shortly after made a fellow of his college. In 1854 he became Professor of Mathematics at Queen's College, Belfast, and in 1860 was elected to the natural philosophy chair at Edinburgh. His experimental investigations into the thermal conductivity of metal bars, and into the thermo-electric relations of metals through wide ranges of temperature, are published in the *Transactions* of the Royal Society of Edinburgh. He is best known, however, for his more purely mathematical researches, including many quaternion applications and an elaborate paper on *Knots* (*Transactions* of the Royal Society of Edinburgh, 1876-77). In conjunction with Steele he has written *Dynamics of a Particle* (1856, 4th ed. 1878), is joint author with Sir W. Thomson of the first volume of a projected exhaustive *Treatise on Natural Philosophy* (1867; 2d ed. 1879), and with Shairp and Adams Reilly of *Life and Letters of Principal Forbes* (1873). His *Quaternions* (1867, 2d ed. 1872) is the best introduction to the subject, and his *Thermodynamics* (1868, 2d. ed. 1877), and *Recent Advances* (1876; 2d ed. 1877), are models of two distinct scientific literary styles—the one designed for science students, the other for general readers. *The Unseen Universe* (1874; 7th ed. 1878), and its sequel, *The Paradoxical Philosophy* (1878), by Balfour Stewart and T., aim at proving, from consideration of the physical principle of 'Continuity,' that science and religion are not inconsistent with each other. A treatise on *Heat* is announced for 1879.

Taiwan', or **Taiwanfu'**, the capital of the Chinese possessions in Formosa (q. v.), lies in a plain, 4 miles from the sea, with which it is connected by canals. These, however, are only navigable for boats, and ships have to anchor 2 miles from land. Girt by a wall 30 feet high and 12 feet thick, the town contains the ruined fortress of Sak-kan, built by the Dutch, is intersected by numerous canals, and carries on a considerable import trade in opium, tobacco, woollen and cotton goods, &c.; sugar is the staple article of export. In 1877 there entered and cleared 284 vessels of 84,461 tons, with cargoes valued at £851,315, about one-half of the trade being in British hands. Some 25 miles to the E.S.E. is the port of Takow, where most of the Europeans in Formosa live. A land telegraph line between Takow and T. was opened in 1877, and the materials for the Wusung railway were landed at T. in 1878. Together, the two towns have an estimated pop. of 235,000. See Petermann's *Mittheilungen* (May 1876).

Talave'ra de la Rey'na, an old walled town of Spain, province of Toledo, on the Tagus, 75 miles S.W. of Madrid by rail. It is situated amid vineyards and olive-groves, and still retains some of its once great industry in silk and earthenware. Pop. 9285. Here the French, under Joseph Bonaparte and Marshals Jourdan and Victor, suffered a severe defeat at the hands of the allies, commanded by Sir Arthur Wellesley, 27th and 28th July 1809. The name T. means 'the town on the wood-clearing.'

Tal'bot, a great historic family descended from Hugh de T., governor of Plessey in Essex (1118). **Sir John T.**, born at Bletchmore in Shropshire in 1373, was appointed lord-justice

of Ireland in 1412, and two years later its lord-lieutenant. In 1419 he entered upon a magnificent career of arms in France, which only Jeanne Darc could stay. She forced him to raise the siege of Orleans, and at Patay (1429), after performing prodigies of valour, he was taken prisoner. On his release he reassumed the command of the English forces, and for his rare success was created Earl of Shrewsbury (1442). In 1452 he was again despatched to France to aid a Gascon insurrection; but on attempting to raise the siege of Chatillon, he was slain with his son, Lord Lisle, 20th July 1453. Shakespeare, in *Henry VI.*, records the valour of this 'great Alcides of the field,' the conqueror in forty battles and dangerous skirmishes.—**Charles**, the twelfth earl (born 1660, died 1st February 1718), was created Duke of Shrewsbury (1694). He was one of the seven who invited over William of Orange; and under him, Anne, and George I. he held high office, being at the same time Lord-lieutenant of Ireland, Lord High Treasurer of Great Britain, and Lord Chamberlain. The dukedom expired with him, but the earldom passed to his cousin, the Rev. Gilbert T., a Catholic priest (died 1743). The senior male line becoming extinct (1856), the earldom was claimed, and after a memorable trial obtained (1858), by Henry-John Chetwynd, descended from a younger nephew of the first earl. His grandson, **Charles Henry John T.** (born 13th November 1860), succeeded his father as twentieth earl, 10th May 1877.

Tal'bot, William Henry Fox, was born at Chippenham, Wiltshire, February 11, 1800, educated at Harrow, and graduated at Trinity College, Cambridge, in 1821. He was member for Chippenham in the reformed Parliament of 1832–38; and about this time began the series of experiments which led him independently to the discovery of photography, and for which he received a medal from the Royal Society in 1842. (See CALOTYPE and PHOTOGRAPHY.) Subsequently he applied himself to antiquarian and philological studies, and was one of the first who successfully deciphered the Assyrian cuneiform inscriptions. His versions were published in the *Transactions* of the Royal Asiatic Society, of the Society of Biblical Archæology, and of the Royal Society of Literature. His chief works are *Hermes*, or *Classical and Antiquarian Researches* (2 vols. 1838–39), *Illustrations of the Antiquity of the Book of Genesis* (1839), *The Pencil of Nature* (1844–46), and *English Etymologies* (1846). He is also the author of a number of mathematical papers of marked originality published in the *Philosophical Transactions* and the *Transactions* of the Royal Society of Edinburgh. T. died September 17, 1877.

Talc, a hydrated silicate of magnesia, containing four equivalents of the base to five of silica. It is of common occurrence as a mineral, being found in large foliated masses, or, like mica, in thin scales. It may be distinguished from the latter mineral by its greater softness and its want of elasticity. T. also occurs as an important constituent of other rocks, *e.g.*, T.-schist and talcose granite, &c. Its specific gravity is about 2·8, and it is translucent, infusible, and unctuous to the touch. T. is used for mixing with porcelain clay, for fulling, and in the manufacture of crucibles and crayons.

Tal'ent, originally a Greek denomination of weight, but from being used in reference to a weight of gold and silver applied to designate a quantity of current money. It was divided into 60 minæ, 6000 drachmæ, and 36,000 oboli; but of these only the last two were coined, the highest coin used by the Athenians being the tetradrachm. The chief varieties in use among the Greeks were the Æginetan, Euboic, and Attic talents, the last of which, introduced by Solon, soon supplanted the others. Its value was nearly 57 lbs. avoirdupois, and as a money designation was reckoned in silver currency. The Italian and Sicilian Greeks used a *gold T.*, also known as the *Sicilian T.*, which was much smaller, being about ⅔ths of an ounce avoirdupois. This is about the value which must be ascribed to the T. as used by Homer. The value of the Æginetan T. (95 lbs. avoirdupois) proves it to have been introduced from the East, probably by the Phœnicians. The modern use of the word as an equivalent of intellectual ability has its origin probably in Christ's parable (Matt. xxv. 14–30).

Talfourd, Sir Thomas Noon, born at Doxey, near Stafford, January 26, 1795, was educated by Dr. Valpy at Reading, studied law under Mr. Chitty, was called to the bar at the Middle Temple in 1821, and rapidly rose in his profession. He represented the borough of Reading from 1835 to 1841, and again from 1847 to 1849, and in the latter year was appointed justice in the Court of Common Pleas. While charging the grand jury at the Stafford assizes he was struck with apoplexy, and shortly after expired, March 13, 1854. T. was an eloquent, able, and laborious lawyer, but his fame rests mainly on his four tragedies—*Ion*, produced by Macready at Covent Garden in 1836; *The Athenian Captive* (1838); *Glencoe, or the Fate of the Macdonalds* (1840); and *The Castilian*, which never appeared on the stage. All these bear witness more or less to the author's deep and fervent study of the Greek drama on the one hand and the poems of Wordsworth on the other—*Ion* being perhaps the finest of the four. He also edited the letters and works of Charles Lamb, and wrote a sketch of his life—*Memorials of Charles Lamb* (2 vols. new ed. 1849–50). A collection of his *Critical and Miscellaneous Essays* appeared at Philadelphia in 1842. See *Memoir of T. N. T.*, by a member of the Oxford Circuit (1854).

Tal'ipat Palm (*Corypha umbraculifera*) of Ceylon and the Malabar coast is a noble tree with a straight cylindrical stem of 60 or 70 feet, surmounted by a crown of enormous leaves, each leaf measuring 10 feet or even more in diameter, and composed of 40–50 segments united beyond the middle and bifid; it is attached to the stem by a prickly root-stalk of 6 or 7 feet long. The tree is consequently admirably adapted for shade and shelter. At the age of thirty to forty years, from the centre of the crown arises an immense erect-compound panicle of bisexual hexandrous flowers. An abundant supply of fruit follows, and after the seed ripens the vegetation of this terminal shoot is completed and the tree dies. Fans, mats, and umbrellas are made of the leaves, and their segments, as also those of the closely-allied species *C. Taliera* (which grows in Bengal), are used for writing upon with an iron style.

Tal'isman (Gr. *telesma*, 'consecration'), any portable object inscribed at certain astrological conjunctions with magic formulæ, that guard its wearer from dangers in general and sorcery in particular. Talismans long used throughout the East assume a multiplicity of forms, but as a rule may be distinguished from Amulets (q. v.) both by their astrological character and by their being only of stone or metal, whilst an amulet may be of any material. Se Lenormant, *La Magie chez les Chaldéens* (Par. 1873).

Tall'age (Fr. *taille*, Low Lat. *tallagium*, from *talea*, 'a tally of wood,' on which the amount of tax was scored), according to Coke, is a general term, including all subsidies, taxes, tenths, &c., but generally it was restricted to taxes received by the king.

Tallahassee, capital of Florida, U.S., 180 miles by rail E. of Pensacola, is well laid out and finely situated, has 5 churches, a state capital, the W. Florida seminary, a cotton factory, machine shops, two weekly papers, &c. Pop. (1870) 2023.

Tallart, Camille, Comte de, was born of an ancient Dauphiné family, 14th February 1652, and entering the army, rose rapidly, thanks to his natural talents and to his cousin, Marshal Villeroi. As early as 1674 he commanded a corps at Mülhausen, and having served under Turenne in Elsass, been wounded at Rheinfelden, and raised to the rank of major-general (1688), he led an army over the frozen Rhine (1692), and mastered the Rheingau at a blow. As skilful a diplomatist as soldier, he helped to negotiate the Peace of Ryswyk (1697), and was employed by Louis to bring England over to the Partition Treaty. It failed to avert the War of the Spanish Succession, in which, under Boufflers, T. signalised himself at Kaiserswerth (1701) and Nymwegen (1702), capturing Trier, forcing Alt-Breisack to capitulate, and stripping the Prince of Hessen-Kassel of the Palatinate. Created Marshal (1703), and with Marsin despatched to command the French troops in Bavaria, T. lost against Marlborough and Prince Eugene the battle of Blenheim (1704), where with 15,000 of his men he fell into the hands of the English. During seven years' captivity in London he managed to secure the favour of Queen Anne, and largely contributed to the recall of his conqueror Marlborough; so when in 1711 he was released without either ransom or exchange, Louis XIV. welcomed him with the title of Duc d'Hostun. He became Minister of State (1726), and died May 30, 1728, leaving behind him the *Campagnes du Maréchal de T.* (Amst. 1762).

Tallegall'a or **Brush Turkey** (*Tallegalla*), a genus of *Rasorial* birds occurring in Australia, and belonging to the family of the *Megapodiidæ* or Mound birds. The *T. Lathami* is the familiar species, and is named the New Holland vulture and wattled T. The average size is that of a turkey, and the colour is a general blackish brown. The 'egg mound' is a collection of decaying vegetable matter, within which the eggs are deposited. The wattles of the male bird are of a bright or orange-yellow colour. The T. feeds on seeds and insects during the period of incubation. The male attends the mound very assiduously, and the young appear to leave it on the third day after hatching. The T. has been domesticated and bred in the gardens of the Zoological Society of London.

Talleyrand-Périgord, Charles Maurice, Comte de, was born in Paris 13th February 1754. His family was one of the most ancient in France, and many of its members had distinguished themselves either in the Church or the army, to the latter of which professions his father, Charles-Daniel, Comte de T.-P., belonged. T. was the eldest of three sons, but having been lamed by an accident while under the care of the foster-mother with whom he spent his early years completely neglected by his parents, he was disinherited and forced to undergo the severe training of the St. Sulspice, the Sorbonne, and the College Rheims, with a view to entering the Church. This he actually did, though he had been principally noted during his student-years for gross licentiousness and love of intrigue. Introduced into Parisian society at the coronation of Louis XVI. in 1774, the youhg Abbé de Périgord, as he was called, made himself notorious for his vices, as well as famous for the polish and suavity of his manners and the brilliance of his wit. In 1775 he was preferred to a rich Abbacy in the diocese of Rheims; in 1778 he was among the first to welcome Voltaire to Paris on his famous and fatal visit, and in 1780 he began his political career in the influential post of Agent-General of the clergy of France. This position brought him into contact with Mirabeau, Calonne, Necker, and other prominent figures of the critical period which preceded the Revolution. Mirabeau at one time writes of him:—'You will never find a man more trustworthy, more religiously devoted to the dictates of friendship and gratitude;' but shortly afterwards his tone changes, and he says:—'For money he would sell his soul, and he would be right, for he would in such case barter dirt for gold.' In 1788 the king unwillingly preferred him to the see of Autun, and on the convocation of the States-General in the following year, he was elected to represent the clergy of his diocese. Appreciating with keen foresight the whole merits of the situation, he identified himself with the popular party, though he was always at heart the haughtiest of aristocrats. He advocated amalgamation with the *Tiers État*, was one of the framers of the Declaration of Rights, and proposed the scheme to nationalise Church property. On the 16th of February 1790 he was elected President of the National Assembly on the 14th of July he, in his clerical capacity, played the leading part in the ill-starred Feast of Federation in the Champs de Mars, and on the 28th of December he was among the first to swear fealty to the new constitution. At the same time he resigned his bishopric, but in the next year we find him consecrating the first two of the new constitutional bishops, in consequence of which he was declared by the Pope a heretic and schismatic. Meanwhile he was doing good service to the State in minor matters. His report on public instruction (September 1791) was an able piece of work; he pointed out forcibly the dangers of the *assignat* system, and promoted the adoption of the present system of uniform weights and measures.

In February 1792 he was sent to the Court of London, nominally in the train of the ambassador, M. de Chauvelin, though he was in reality himself the ruling spirit of the embassy. That even his diplomacy could effect little or nothing was attributable to the position of affairs, which was altogether too unfavourable. It was fortunate for him, however, that he was out of France in December 1792, when a letter discovered in the famous 'Iron Chest,' and supposed to implicate him in Royalist schemes, led to his proscription, and would certainly have led to his death had he been within reach of the Government for the time being. The 'Alien Act' drove him out of his asylum in England, and on the 3d of February 1794 he embarked for America. Here he remained for more than a year, chiefly in Philadelphia, making good use of his opportunities for political observation, as his work on the relation between the United States and England subsequently proved. At the close of the Reign of Terror he returned to France, and on the 15th of July 1797 he was appointed to the Ministry of Foreign Affairs. With his unfailing sagacity he now discerned the importance of Bonaparte, to whom he at once attached himself. Driven from his ministry in June 1799 by the unpopularity accruing partly to the Directory as a whole, partly to certain special acts of venality and corruption, he concerted with Bonaparte the plan of the *coup d'état* of the 18th Brumaire. Throughout the following years he co-operated in all the schemes of Napoleon, promoted the establishment of the empire, and carried out other political measures far too numerous to mention. For these services he was created Vice-Grand-Elector of the Empire and Prince of Benevento (1806); but falling into disfavour shortly afterwards, he resigned his portfolio 9th August 1807. Meanwhile he had acquired immense wealth. It is said that when Napoleon questioned him as to how it had been amassed, he replied—'The simplest thing in the world, General: I bought stock the day before the 18th Brumaire, and sold it again the day after.' From 1807 till 1814 he remained 'in opposition.' On the downfall of the emperor he was again appointed Foreign Minister. At the Congress of Vienna he was the French plenipotentiary, but was again forced to resign his portfolio on the 28th of September 1815. For fifteen years he now remained under a cloud. After the July Revolution of 1830 Louis Philippe appointed him Ambassador at the court of St. James's. This post he held for five years, and was instrumental in bringing about cordial relations between France and England. He returned to France in 1835, and died at Paris, May 17th, 1838. A diplomatist of extraordinary genius, T. was perhaps even more notable for his total lack of principle. His methods of policy may be described as Macchiavellian, perhaps even more justly than those of Macchiavelli himself. To him is often attributed the famous maxim, *La parole n'a été donnée à l'homme que pour d'equiser sa pensée*, though it belongs originally to the English poet Young. He is said to have left *Mémoires* of his life, with directions that they should not be published till forty years after his death. That period has now (1878) arrived, and there have been rumours of the approaching publication of the volumes, but as yet nothing definite is known of them. For T.'s life and character see the historians of the Revolution *passim:* also Salle's *Vie Politique du Prince C. M. de T.* (Berl. 1838); Touchard Lafosse's *Histoire Politique et Vie Intime de T.* (Par. 1848); Sainte Beuve's *Monsieur de T.* (Par. 1870); Pichot's *Souvenirs Intimes sur M. de T.* (Par. 1878); *Reminiscences of Prince T.* (Lond. 1848; and Baron Dalling and Bulwer's *Historical Characters* (5th ed. Lond. 1876).

Tallicoo'nah Oil. See CARAPA.

Tallien, Jean Lambert, was born in Paris in 1769. His talent for writing and speaking soon brought him to the front at the Revolution. After being for some time connected with the *Moniteur*, he became editor of the *Ami des Citoyens*, a journal after the fashion of Marat's *Ami du Peuple*. A prominent Jacobin, he became after the 10th of August secretary of the Insurrectionary Commune, was one of the leading 'Septembrists' (q.v.), and afterwards eloquently defended the massacres he had promoted. His 'services' on this occasion gained him a seat in the Convention, where he of course joined the Mountain, and was an earnest defender of Marat, and a savage advocate for the execution of the king. Sent by the Convention to Bordeaux and the western departments in 1794, he at first distinguished himself by a cruelty and profligacy worthy of the most infamous of the Terrorists. In the prison of Bordeaux, however, he met the beautiful Madame de Fontenai, *née* Senhora Tereza de Cabarrus, for whom he conceived a violent passion. He liberated her from prison, and drew down upon himself the suspicion of the central authorities by relaxing the cruelty of his persecutions. Recalled to Paris, he managed by an assumption of revolutionary fervour to avoid an immediate downfall, but the hatred and suspicion of Robespierre were not allayed. Madame de Fontenai was imprisoned. 'Shut in the horrid pinfold of death,' says Carlyle, 'the senhora smuggles out to her red-gloomy T. the most pressing entreaties and conjurings: Save me; save thyself!' This could only be accomplished by the ruin of Robespierre (q. v.). T. placed himself at the head of the party afterwards known as the Thermidorians, vigorously attacked the

triumvirate of terror, and ultimately brought about its downfall. From this point his political influence declined. Madame de Fontenai, on the other hand, whom he now married, became the most prominent personage in Parisian society, her salon, thronged by the party known as the *jeunesse dorée*, being the most brilliant of the brilliant period of the Directory. T. continued in the Legislature till 1798, when he accompanied Bonaparte to Egypt in the character of *savant*. The ship in which he was returning was captured by an English cruiser, and he was *fêted* by the Whig party in London in 1801. In 1802 he was divorced from his wife, who afterwards married the Prince de Chimay, and died November 16, 1831. T., after holding for some years the post of French consul at Alicante, died at Paris, November 16, 1820, in poverty and obscurity.

Tall'is, Thomas, the father of English cathedral music, was born about 1529. During the reigns of Henry VIII. and Queen Mary he was a gentleman of the chapel-royal, a position more important than his salary of 7½d. a day might indicate. On the accession of Queen Elizabeth T. seems to have embraced the Reformed faith, and to have become organist of the chapel. He published in 1575, in connection with Byrd, *Cantiones Sacræ*, a collection of anthems and hymns, which was protected for twenty-one years by the first patent of the kind ever issued. He set to music the portion of the English liturgy which is now sung, including the morning, evening, and communion service, and the litany and responses. His style was learned, grave, and devout, and he may be considered altogether the greatest English composer before the days of Henry Purcell. That he was a master of counterpoint is proved by his extraordinary *Song of Forty Parts* (8 separate trebles, 8 mezzo-sopranos, 8 counter-tenors, 8 tenors, and 8 basses), which, abounding with subjects of fugue and imitation, extends to 138 bars in *allabreve* time. There are extant his *Order of Daily Service* (edited by Bishop, 1843, and by Rimbault, 1847), *Full Cathedral Service* (edited by Rimbault, 1847), and *Order for Morning Prayer, with the Litany Noted* (new ed. 1854). T. died November 23, 1585, and was buried in the old parish church of Greenwich.

Tallow. See OILS.

Tallow Tree (*Excœcaria*, or *Stillingia sebifera*) is a small tree indigenous and cultivated in China and Japan, and introduced into the Southern United States, &c., where it thrives luxuriantly. It belongs to *Euphorbiaceæ*, and has dry, smooth, fruit of ½ inch diameter, containing three seeds inclosed in a thick layer of white fatty substance. In Japan and China this fatty material is separated by boiling in water. It is then made into cakes and pressed, 'when the pure tallow exudes in a liquid state, and soon hardens into a white, brittle mass.' It is harder than animal tallow, and candles are made of it, which are coloured, and generally used in Chinese temples. The seeds (after the tallow is removed) yield a liquid oil, and a black dye is made from the leaves.

Tall'y (Fr. *tailler*, 'to cut'), a piece of wood bearing notches or other marks indicative of a commercial transaction. In the Exchequer peeled hazel or willow rods, split so that each part contained one-half of every notch, were the regular form of acquittance till 1782, the part given to the payer being called the *stock*, that retained by the Exchequer the *counterstock*. This ancient system was abolished by 25 Geo. III. c. 82; and by 4 and 5 William IV. c. 15 old tallies were ordered to be destroyed. The burning of the Houses of Parliament (16th October 1834) arose from the stoves being overheated with these discarded tallies.

Tal'ma, François Joseph, one of the greatest of French tragedians, was born in Paris, January 15, 1763. His childhood was passed in London, where his father was a dentist, and he was himself destined for the medical profession. Returning to Paris at the age of fifteen, however, he began to frequent the Théâtre Français, and was seized with an enthusiasm for the stage. He shortly afterwards took part in the performances of some French amateurs in London, which created such an impression that Lord Harcourt and other gentlemen begged him to devote himself to the English stage, offering him an engagement at Drury Lane, which he would probably have accepted had not family circumstances recalled him to Paris. He made his *début* at the Théâtre Français on November 21, 1787, in the part of 'Séide' in Voltaire's *Mahomet*. His success was complete, though he could not be said to 'have taken the town by storm.' As early as April 1, 1789, he became a *sociétaire* of the National Theatre. From this time forward his career was a series of triumphs, which lasted through the Revolution, the Empire, and well on into the Restoration. He performed for the French stage the service which Kemble did for the English stage, in introducing historical correctness in costume and decoration. It is related that when he first appeared in the *foyer* of the Français dressed in correct Roman costume, one of the actresses exclaimed '*Voyez donc Talma, qu'il est ridicule! Il a l'air d'une statue antique*'—a piece of unintentional but well-deserved flattery. He was a personal favourite of Napoleon, in whose train he visited Germany. In Brussels, too, he was exceedingly popular, and two performances which he gave in London in 1817 excited immense enthusiasm. T. died at Paris, October 19, 1826. Among his principal parts were Charles IX. in Chénier's drama, Egisthe in *Agamemnon*, Othello and several other Shakespearean characters in Ducio's adaptation, &c. See Moreau's *Mémoires Historiques et Littéraires sur F. J. T.* (Par. 1826), and an Autobiography, edited by A. Dumas (4 vols. 1849–50).

Tal'mud, The (Heb. *lāmād*, 'to learn'), is the whole body of Jewish civil and theological law. It is the outcome of the *Midrāshîm*, those expositions and disquisitions on Biblical topics customary during the 300 years that elapsed from the rise of the Asmonean dynasty till the age of Hadrian. At first these were simple, but gradually through disputation, the search for hidden meanings in the letter, and the like, they became more complicated, and were distinguished into two classes, the *Halacha* (q. v.), or 'rule,' and the *Haggada* (q. v.), which were more homiletic. Oral transmission was long the only means of preserving either; to write down Halacha or Haggada was sacrilege, and, when practised, was only partial and clandestine. The official Halachic redaction forms the *Mishna* (q. v.). But many Halachas, known as *Boraitas* and *Toseftas*, were omitted in the Mishna. These with the Haggadas were redacted in the T., or rather Talmuds, for there are two, the *Jerusalem* and the *Babylonian*. Each of these consists of two parts, the Mishna, which is the same in both, and the *Gemāra*, 'completion' (Heb. *gamār*, 'to complete,' less likely from Aramaic *g'mar*, 'to learn'), or commentary on the Mishna, in which they mutually differ much. The present recension of the Jerusalem T. was made, according to Moses ben Maimon, by Rabbi Jochanan of Tiberias, about 279 or 282 AD. Probably the plan is due to him, but the work was completed by his scholars or other learned men, most likely at Jerusalem about 400. The Babylonian T., which is about four times the size of the Jerusalem, was mainly the work of Rabbi Ashe of Sura, in Babylonia, between 350 and 430, when Tiberias and the other Palestinian schools were all but extinct, and the Babylonian academies of Nisibis, Nahardea, Pumbaditha, and Sura rivalled one another in extraordinary zeal for Rabbinic study. The two last-mentioned schools completed the work, probably in the 6th c. The language of both Gemaras is Aramaic, that of the Jerusalem being somewhat near to Syriac, while that of the Babylonian is purer both in grammar and vocabulary, and therefore easier. But, on the whole, it is true of both, that the style is all but 'unconquerably difficult,' and the language 'frightfully rough.' In both the Gemara follows the Mishna with extreme closeness through the 6 *sedarim* or orders, 63 *massictoth* or treatises, and 525 *perakim* or chapters into which it is divided; giving explanations, differences of opinion, final judgments according to majority or minority of voices, and so on. Its contents are most heterogeneous, not only religious and philosophical, but treating of jurisprudence, medicine, history, &c., often legendary and fabulous, trivial, ridiculous, even all but blasphemous. It is certainly a monument of human folly as much as of human learning and wisdom; but it is only fair to admit that it contains a most important mass of laws and opinions, that its ethics, as in the justly-renowned *Pirke Aboth* (sayings of the fathers), are often very high, and that many, perhaps most, of its apparently flagrant absurdities are merely the parabolic clothing of a hidden meaning, as in the invectives against the Christians, and the like; while the rest are due to that superstitious veneration for the mere words of the wise men of the past, which prevented the Jewish redactors from abridging and omitting as they ought. The T. is comparatively useless for Old Testament interpretation, but the light which it sheds on many points of the New Testament, and on the early

history of the Christian Church, is simply incalculable. See article 'Thalmud' in Herzog's *Real-Encyclopädie für Theologie und Kirche*; Grätz, *Geschichte der Juden*; Emanuel Deutsch, *Literary Remains*; Canon Farrar, articles in the *Expositor* (1877-78); Rabbinovicz, *Législation Civile du T.* (Par. 1878); and Dr. Barclay, *Translations from the T.* (1878).

Tal'pa and **Tal'pidæ**. See MOLE.

Tálúk', properly **Taallu'qah**, an Arabic word implying dependence, used through India for a species of land-tenure. In Bengal Proper the T. is an estate subordinate to the *zemindary* or estate in chief; one class pays its revenue direct to Government, the other only through the *zemindar*. In the N.W. Provinces the term is applied to an estate divided between several proprietors, superior and inferior, of whom the latter pay revenue through the former. In Oude the term is used of the great landholders, some of whom have the title of Rajah or Maharajah, and immense incomes. In Madras, a T. is merely a large revenue division. The holder of a T. is called a *talukdar*. See Wilson's *Glossary of Indian Terms* (Lond. 1851).

Tam'ara Spice, a compound of cinnamon, cloves, coriander, anise, and fennel-seed, esteemed as a condiment in Italy.

Tam'arin (*Midas*), a genus of Platyrhine or New World monkeys of small size, having a short muzzle and a beautiful soft silky fur. The silky T. (*M. rosalia*), and the *M. leonina*, or little lion monkey, are two familiar species. The former is of a golden hue, and the latter derives its name from the great development of hair on the neck and head.

Tam'arind (*Tamarindus Indica*), a lofty tree of the *Cæsalpineæ* sub-order of *Leguminosæ*, and the sole species of the genus. It reaches a height of 80 feet or more, and has a short thick trunk surmounted by a magnificent, broad, and high shady crown of pinnated leaves, mixed in the following season with racemes of sweet-scented flowers. The pendulous pods vary from 3 to 8 inches in length, by about 1 inch broad, containing within their brittle brown shell a layer of acid pulp traversed by strong fibres. The tree, which is presumably a native of tropical Africa and Asia to N.W. Australia, is cultivated in the tropics of the New and Old World principally for the pulp of the legume, which is used locally in cookery and for other purposes, and is exported to Europe for service in medicine. That from the W. Indies is usually preserved in small kegs between layers of sugar, hot syrup having been poured over the whole; the E. Indian comes in the pods, sometimes cured in salt. The grateful acidity of the pulp depends upon citric, malic, and tartaric acids; it is also rich in humic and butyric acid. The T.-pulp acts medicinally as a gentle laxative. Infused in water, it makes a refreshing beverage; and boiled with milk and strained, a pleasant cooling whey is produced, given occasionally in fevers. A very good gargle for sore throat may be prepared from the pulp of the fresh pods. The wood is yellowish-white, hard, and close-grained, with a very durable dark-coloured heart-wood, which polishes well, and is highly prized for many purposes, such as wheels, mallets, tent-pegs, oil-presses, sugar-crushers, furniture, &c. T. is Latinised from the Arabic *tamer-hindy*, 'Indian-date.'

Tam'arisk (*Tamarix*), a genus of about 20 species of shrubs or small trees, with inconspicuous often scale-like leaves, and dense spikes of small white or pink flowers. The genus, which is the 'type' of the natural order *Tamaricaceæ* or *Tamariscineæ*, is widely diffused in cold, temperate, and hot regions, often in sandy or saline situations. *T. gallica* is the best-known species. It is a native of S. Europe, N. and tropical Africa, S. Asia (as *T. Indica*), ascending in the Himalayas to 11,000 feet, and reaching China and Japan. This shrub adapts itself to the most diverse localities. It is also one of the most tractable plants in culture, as it is readily multiplied from cuttings which strike root with remarkable ease and push forth stems with unusual vigour. Hence it is one of the most eligible shrubs for planting on coast sand to stay its drifting, or for lining embankments. In India the wood is much used for fuel. *T. germanica* is likewise available for arresting the ingress of shifting sand and for solidifying precipitous river-banks. *T. articulata* or *orientalis*, of N. and Mid. Africa and S. Asia, grows into a fair-sized tree. Its wood serves in India for ploughs, wheels, &c., and its bark is used for tanning. T.-manna is produced on the twigs of several species of T. by the puncture of an insect. For T.-galls see TACAHOUT.

Tambour' (Fr. *tambour*, a 'drum'), a circular frame on which muslin or other stuff is stretched for the purpose of being embroidered. This kind of needlework, known as 'tambouring,' was formerly a domestic female industry in Scotland. T., in architecture, denotes the naked ground of the Corinthian and Composite capitals on which the leaves are placed, also the walls of a circular temple surrounded with columns, and further the vertical part above and below a cupola. T., in fortification, is a small work, intended to defend a road, gate, or other entrance, and is usually constructed of wood and provided with loopholes.

Tambourine' (*Tambour de Basque*), a musical instrument of percussion very popular in the S. of Europe, particularly in Italy and Spain. It is formed of a hoop of wood, like one end of a drum, over which parchment is stretched. Small pieces of metal called jingles are inserted in the hoop, to which also tiny bells are sometimes attached. The effects produced by striking the T. with the knuckles are called 'flamps' or 'semi-flamps,' that obtained by drawing the fingers over the surface of the skin, the 'travale' or the 'roll.' The ancient *tympana*, representations of which are found at Pompeii, resembled this instrument.

Tambov', a government in the S.E. of Russia. Area 25,583 sq. miles; pop. (1870) 2,150,971. It consists mainly of an elevated plateau sloping gradually to the S., more than half of which is under cultivation, the remainder chiefly in forest. In 1873 T. possessed 495 industrial establishments, of which distilleries were the chief; ironfoundries, spinning-mills, and sugar-refineries also employing a large number of hands. It contains, besides the capital, about a dozen flourishing towns of upwards of 7000 inhabitants, but the remoter villages are very poor, the walls of the houses being often formed of interwoven branches.—**T.**, the capital, lies on the Zna, has 15 churches, and manufactures shawls, sailcloth, tallow, &c. Pop. (1870) 26,403.

Tame Animals, Laws Regarding. See ANIMALS, CRUELTY TO; and under DOG, *Laws Regarding Dogs*.

Tam'erlane. See TIMUR.

Tamil', a language belonging to the Dravidian (q. v.) branch of the Turanian family of speech. It is the most highly cultivated member of that branch; and according to the Census of 1871 is spoken by nearly fifteen million persons in the S.E. of the Madras Presidency. See Grant, *Bibliotheca Tamulica* (Leip. 4 vols. 1854-65); and Caldwell's *Comp. Grammar* (Lond. 2d ed. 1875).

Tamm'erfors (Finn. *Tampere*), a thriving town of S. Finland, Russia, government of Abo-Bjorneburg, on Lake Naesi, 92 miles N.W. of Abo, with manufactures of cottons, woollens, paper and machinery. Pop. (1875) 8443.

Tamm'uz was a Syrian deity for whom the Jewish women held an annual lamentation (Ezek. viii. 14), doubtless borrowing the practice from the Phœnicians. T. has generally been identified with the Phœnician sun-god Adonis (q. v.), or the Egyptian god Osiris (q. v.). The Adonia or feast in honour of Adonis commenced with the new moon of July, when on a certain night an image of the god was laid out on a bed by women, and bewailed in woful ditties. After a time spent in this way lights were brought in, and the mouths of the mourners anointed by the priest, who whispered, 'Trust ye, communicants, the god having been saved, there shall be to us, out of pains, salvation.'

Tamm'y (Fr. *étamine*, from *estame*, 'worsted'), a thin glossy stuff wholly of wool, or of wool mixed with silk or cotton. Originally applied to an all-worsted fabric, the manufacture of which can be traced many centuries back, the name T. is now borne by different kinds of glossy fabrics of English and French production.

Tampan', a species of Tick (q. v.) described by Dr. Livingstone as occurring in Angola, and notable for its irritating bite. It usually selects the interspaces of fingers or toes, and adheres to the skin by means of a well-developed proboscis, drawing a large quantity of blood, and causing symptoms resembling those of acute inflammation.

Tampi'co, a seaport of Mexico, state of Tamaulipas, on the Panuco, 5 miles from its mouth, on the Gulf of Mexico. The harbour is not accessible to large vessels on account of the river-bar, but the trade in the roadstead is considerable and is increasing. The exports are chiefly hides, salted meat, bones, and tallow. T. is healthier than Vera Cruz, but is scantily supplied with good drinking-water, and is liable to attacks of yellow fever. Pop. 7000.

Tam-Tam, an Oriental instrument of percussion of the gong species, oval in shape.

Tam'worth, a market-town on the border of Staffordshire and Warwickshire, stands at the confluence of the Tame and Anker, 6½ miles S.E. of Lichfield by rail. It has a fine old church, of different styles, from Norman to Perpendicular, and a modernised Norman castle, other buildings being the 17th c. town-hall, a grammar-school (1868), while in the market-place is a bronze statue of Sir Robert Peel (1852). There are manufactures of paper and small-wares, and coal and fire-clay pits, with market-gardens employing many persons. T. publishes one weekly newspaper, and returns two members to Parliament. Pop. (1871) of municipal borough, 4589; of parliamentary, 11,493.

Tan'ager (*Tanagra*), a genus of *Insessorial* Birds, belonging to the family *Fringillidæ* (q. v.). The bill is triangular, and arched at its tip. The hinder toe is well developed, and the claws are strong. The T. occurs chiefly in tropical America. Its food consists of seeds, berries, and insects. The Organist T. (*T.* or *Euphonica musica*) is so named from the clearness and volume of its song. The Scarlet T. (*Pyranga rubra*) occurs in summer in the United States, but migrates southwards in winter.

Tananarivo. See ANTANANARIVO.

Tan'cred, son of the Marquis Odo the Good and of Emma, Robert Guiscard's sister, was born in 1078, in 1098 assumed the cross, and with his cousin Bohemond (q. v.) set out upon the First Crusade. Through the Byzantine empire they marched to Constantinople, whence T. crossed the Bosphorus disguised as a common soldier, that so he might escape from swearing allegiance to the emperor. Alexios followed the Crusaders, and T. reluctantly, yielding to Bohemond's counsel, took the required oath. At Dorylaion (4th July 1097) his bravery saved the camp of priests and women; his banner was the first to float from the towers of Tarsus, though Baldwin's jealousy dislodged it thence. In the siege of Antioch he slew, say chroniclers, 700 infidels; with Robert of Normandy he first set foot in the Holy City, 15th July 1099. Appointed by Godfrey de Bouillon prince of Galilee, he founded churches in Nazareth, in Tiberias, and on Mount Tabor, and helped at Ascalon to guard the new Christian kingdom against the Fatimite calif. His efforts on Godfrey's death (1100) to secure the crown of Jerusalem to Bohemond only roused Baldwin's jealousy again; but his own principality he held successfully against both Turks and Greeks, even Edessa owning his supremacy. He was busy with plans for bringing the Syrian chieftains under his sway, when he died at Antioch of a wound received in battle (1112). Valiant and, for the age in which he lived, humane, T. stands forth as type of 'a very gentle perfect knight;' in him was embodied the chivalrous spirit of the Crusade. See Schmerbauch, *T., Fürst von Galiläa* (Ef. 1830); Von Sybel, *Geschichte des ersten Kreuzzugs* (Düss. 1841); and G. W. Cox, *The Crusades* (Lond. 1874).

Tandah, a town in the district of Fyzabad, Oude, British India, 3 miles from the left bank of the Ghogra River, 60 miles S.W. of Lucknow. It is the seat of the largest weaving colony in the province, who manufacture both coarse cloth and fine muslin. Pop. (1869) 13,543.

Tanganyik'a, a large lake of Central Africa, discovered by Burton and Speke, 13th February 1858. It is situated between 3° 20' and 8° 47' S. lat., its centre being in 30° E. long. T. is 390 miles long, from 15 to 60 miles broad, and 2710 feet above the sea-level. Its waters are deep and fresh, though insipid, and abound with fish, hippopotami, and crocodiles. The lake is hemmed in by lofty cliffs, and the surrounding country is mountainous, well wooded, and thickly peopled. On its W. shore is Ujiji (q. v.). The name T., according to Cameron, signifies 'the mixing place,' referring to the great number of streams which empty into the lake; according to Stanley, 'the plain-like lake,' having reference to its size. The lake has no present outlet, but as its level is rapidly rising, Mr. Stanley predicts that before long it will discharge by the Lukuga, a creek on its western shore, into the Lualaba or Upper Congo.

Tan'gent is a right line which touches but does not cut a given curve. In modern analysis it is regarded as the limit of a line cutting the curve as the two contiguous points of section approach each other indefinitely, and may therefore be defined as the line passing through two consecutive points on the curve. On a surface there are an infinite number of tangents through a given point corresponding to the infinite number of possible plane sections of the surface through that point, and these tangents all lie upon a plane, called the T. plane at the point. (See CONTACT.) In Trigonometry (q. v.) the T. of an angle is the length of the T. drawn at the one extremity, and intercepted by the radius produced through the other, of the subtending arc obtained by describing round the angle a circle of unit radius.

Tan'ghin (*Tanghinia veneniflua*), the 'ordeal' bean of Madagascar, stands foremost among inflammatory poisonous plants. It belongs to the dog-bane family, and has an ellipsoid fruit 2 or 3 inches long containing a hard nut surrounded by a thick fibrous flesh. The fruit or the kernel only (for accounts differ) is used as a test of crime. If the accused retained the poison in the system, death quickly resulted—a proof of guilt; but if the stomach rejected the dose little harm supervened,—and innocence was established.

Tangier', or **Tanja**, a seaport of Morocco, situated near the W. entrance of the Strait of Gibraltar. It has a fair harbour, and numerous fortifications. The streets are narrow and dirty, and the houses mean. The trade of T. is considerable, the imports in 1877 amounting in value to £370,300, and the exports to £148,333. A red light was placed on the pier in 1876, and a spacious fondack or bazaar was opened in 1878. T. was held by Portugal from 1471 to 1662, and by Britain from the latter year to 1684. Pop. 12,000.

Tangle, a common name for *Laminaria digitata* and *L. saccharina*, two large *Algæ*, with plain ribless fronds, found on the coasts of northern seas growing on rocks exposed only at low-tides, but often found washed ashore. Formerly T. was largely collected for Kelp (q. v.), and is still used under Stanford's process for manufacturing seaweed products. It also serves for manure and for feeding cattle. The young stems and fronds of *L. saccharina* are still sometimes brought to market as an article of food.

Tan'istry, a custom of succession among the Gaelic Celts, according to which the right of succession was not in the individual, but in the family to which he belonged; *i.e.*, succession was hereditary in the family, but elective in the individual. The family or clan or nation could choose its head. This held good also in regard to monastic offices. See Skene's *Celtic Scotland* (vol. ii. cap. 2).

Tanjore', the chief town of the district of the same name, in the Madras Presidency, British India, 50 miles due E. of Negapatam, on the Coromandel coast, and 215 S. of Madras by the new S. Indian railway. Pop. (1871) 52,175. It is a large town, with a wall 4 miles in circumference, numerous temples, and narrow streets. The chief buildings are the great pagoda (200 feet high and highly ornamented) and the palace of the Princess of T., a descendant of a brother of Sivaji the Great. The manufactures are cloths of silk and cotton, carpets of cotton, wood-carving, brasswork, jewellery, and pith models.—The *district* of T., which occupies the delta formed by the Cauvery and Colerun rivers and the flat plain to the S., has an area of 3739 sq. miles. Pop. (1871) 1,973,731, of whom a considerable proportion are native Christians. This is the populous and most fertile tract in S. India, being irrigated by means of the anicuts or weirs further up the Cauvery river, in Trichinopoly District (q. v.). In addition, there are more than 20,000 miles of minor embankments, which saved this region from the famine of 1877. The staple crop is rice, which is annually exported to the amount of 75,000 tons. Other products are sugar-cane, cotton, tobacco, plantains, and betel-nut palms. The total exports by sea in 1874-75 were valued at £847,000; the imports at £358,000. The seaport is Negapatam; the civil headquarters are at Combaconum. This tract first came under British administration in 1799. The last Mahratta Rajah of T. died in 1855, but the family

are still in receipt of a pension, and their claims to re-instatement have been strongly urged of late years.

Tank-Worms, the name given to those *Scolecida* (q. v.) which occur in water-tanks in India and other tropical countries. The young or embryo of the Guinea-worm (q. v.) is supposed to be represented by one of the T.-W.

Tann, Ludwig, Freiherr von, a general in the Bavarian army, was born at Darmstadt, June 18, 1815, and entered the Bavarian service as lieutenant in 1833. In 1840 he became first-lieutenant of the staff, and in 1844 of the adjutant to the Crown Prince Maximilian, whom he accompanied on his travels in Greece. In 1848 he led a troop of volunteers in the revolt of Slesvig-Holstein against Denmark, and distinguished himself at Hoptrupp and at Düppel. Shortly before the conclusion of the war he returned to Bavaria, where he became successively colonel in 1850, major-general in 1855, general adjutant of the king in 1859, and in 1860 lieutenant-general and commander of a division. In the war of 1866 he acted as chief of the staff of Field-Marshal Prince Karl, and in 1869 became general of infantry with the command of the First Bavarian army corps, which took a distinguished part in the battles of Wörth, Beaumont, Sedan, and Orleans. He was, however, forced to retreat from Orleans, and received on the 9th November a severe defeat from General Aurelle, losing 10,000 prisoners and two guns, and being driven back to Artenay. The arrival of reinforcements under the Grand Duke of Mecklenburg enabled the German army to recover their position, and T. earned fresh glory for himself at Baroches-les-Hautes, Orleans, and Beaugency. Since the war he has resided at Munich as general-commandant of the first army corps.

Tann'ah, the chief town of the district of the same name, in the Bombay Presidency, British India, 24 miles N. E. of Bombay by rail; pop. (1872) 14,299. The first railway in India was opened from Bombay to T. in 1853. The *district* of T., which lies between the E. Ghauts and the Arabian Sea, has an area of 4052 square miles; pop. (1872) 847,424. It produces abundant grain, especially rice; other crops are sugar-cane, plantains, cocoa-nuts, and ginger. The *district* includes the islands of Bassein and Salsette.

Tann'ahill, Robert, a Scottish poet, was born at Paisley, June 3, 1774. The son of a weaver, he was apprenticed to the loom when twelve years of age, and with the exception of two years spent in England, the rest of his short life was consumed in the simple routine of his craft, amid the homely circumstances of his native town. In 1805 he ventured to publish a volume of verse entitled *The Soldier's Return: a Scottish Interlude in Two Acts, with other Poems and Songs, chiefly in the Scottish Dialect*. It was successful; his ambition was kindled, and all his dream was how to establish the poetic fame which he had begun to win. Disappointments came; his mind gave way; and on the 17th May 1810 the gentle-hearted poet was found drowned in the canal. T. is not great, but he is immortal. Many a poet who has reached a far higher heaven of invention might be glad to exchange his forgotten glories for the ever-living charm of *The Braes o' Gleniffer*, *Gloomie Winter's noo awa'*, *Jessie the Flower o' Dunblane*, *Thou Bonnie Wood o' Craigie Lea*, and *The Lass o' Arranteenie*. The best edition of T.'s works was prepared for his centenary, with a *Life* by the late David Semple (Pais. 1874).

Tann'er, Thomas, born at Market-Lavington, Wiltshire, 25th January 1674, after studying at Queen's College, Oxford, obtained an All Souls' fellowship. He became rector of Thorpe in Norfolk (1701), canon of Ely (1713), archdeacon of Norfolk (1721), canon of Christ Church (1724), and Bishop of St. Asaph (1732), dying at Oxford, 14th December 1735. Besides preparing the second edition of Wood's *Athenæ Oxonienses* (1721), S. published *Notitia Monastica, or a History of the Religious Houses in England and Wales* (1695; 3d ed. 1787), while after his death appeared the erudite *Bibliotheca Britannico-Hibernica* (1748), giving accounts of all the chief British authors down to the close of the 16th c.

Tannhäus'er was, according to the legend, a *minnesinger*, who, when riding by the Hörselberg, saw a vision of Venus, who kept her court here. Allured by the beauty of the goddess, he entered, as many others had done before him, the recesses of the mountain, and there led a life of mad gaiety and revel for seven years. Unlike his predecessors, T. was destined yet once more to reappear on earth, for at the end of that period, moved by a sudden revulsion of feeling, he tore himself from the arms of Venus, and took his way to Rome, where he besought absolution from the pope, Urban IV. (1261-65). The stern pontiff repelled him at first, till, moved by a miracle, he prepared to grant the required boon. But it was now too late. T. had disappeared, and was never more seen on earth. This legend is but the German form of a far-spread myth. 'There are parallel examples,' says Baring-Gould in his *Curious Myths of the Middle Ages*, 'in modern Greek, Albanian, Neapolitan, French, Danish, Norwegian, Swedish, Icelandic, Scotch, and Welsh.' The German legend has later additions, as that the trusty Eckhart was appointed to warn travellers from the mountain. Tieck (q. v.) has made it the subject of a beautiful story in his *Phantasus*. Wagner has treated it in one of his operas, and Morris and Swinburne, in modern English literature, have embodied the old story in beautiful verse. It is worthy of note that a *minnesinger* named T. lived during the papacy of Urban. He was able and cultured, but wild and dissipated. It is not clear, however, that he is the subject of the old myth. Heine in his *Ueber Deutschland* considers the legend, in its modern form, to represent the struggle between Christianity and Paganism.

Tann'in or **Tann'ic Acid** ($C_{27}H_{22}O_{17}$) constitutes the astringent principle of many vegetable matters, and probably exists in several distinct modifications. The most important of these is that obtained from oak-bark or nut-galls, known as *gallotannic acid*. It is prepared by infusion in water of powdered nut-galls; and by careful evaporation of the resulting solution, a yellowish friable uncrystallised porous mass is left behind, which is very soluble in water, less so in alcohol, and very slightly soluble in ether. A strong solution gives with mineral acids precipitates which are nearly insoluble in acid liquids. With ferric salts, gallotannic acid gives a deep bluish black precipitate, which is the basis of writing ink (see INK). Hence an infusion of T. is a useful test for the presence of iron. With a great variety of organic and especially animal substances, such as albumen, starch, gelatine, skin, muscular fibre, etc., T. forms insoluble compounds which resist putrefaction. Upon this principle the operation of tanning depends. See LEATHER.

Medicinal Properties of T. A.—T. A. is a pure astringent; and, owing to its property of coagulating albumen, it cannot be absorbed into the blood. Before absorption, T. A. is converted into *gallic acid*; so that when the part to be acted on can only be reached through the circulation, the latter is to be preferred. The local action of T. A. is much more powerful than that of gallic acid, and it may be administered to overcome relaxation, as in cases of spongy gums, mercurial sore mouth, chronic sore throat, and hæmorrhoids; and as a styptic to check hæmorrhage when the source can be reached directly, as in epistaxis, hæmatemesis, hæmorrhage from the bowels, &c. T. A. is also employed, locally, to arrest excessive secretions, as in leucorrhœa, diarrhœa, excessive perspiration, chronic ulcers, &c.; and for hardening parts exposed to friction, as sore nipples and tender feet.

Tann'ing. See LEATHER.

Tann'ing Sub'stances. All vegetable substances which contain Tannin (q. v.) or Tannic Acid (q. v.) in applicable quantity may be employed as T. S., and that principle is found most richly in the barks of many trees, and in the husk or shell of various seeds, in leaves, and in various excrescences caused by the puncture of insects. The most important T. S. are barks, and these are enumerated under Barks, Tanning (q. v.). Other substances used in tanning are sumach, which consists of the dried leaves and young twigs of various species of *Rhus* growing on the Mediterranean coasts and in the United States. It contains 12 to 16 per cent. of tannic acid. Divi-divi, the pod of a leguminous tree, *Cæsalpinia coriaria*, said to yield 50 per cent. of tannic acid; algarovilla, the capsules of *Prosopis pallida*, and Bablah pods of *Acacia bablah* are occasionally used as T. S. Valonia, the acorn-cups of *Quercus ægilops*, is a valuable source of tannic acid, yielding as much as 45 per cent. Still more rich are the various kinds of Galls (q. v.), but these are chiefly used for ink manufacture; and several of the other substances above enumerated are more largely employed in dyeing than in tanning.

Catch, gambir, and kino are astringent extracts containing a large percentage of tannic acid, and they are much employed in the quick tanning of leather.

Tan'sy (*Tanacetum*), a genus of *Compositæ*, numbering about 50 species of strong-scented herbs, often shrubby below, with alternate usually much-divided leaves, and solitary or corymbose heads of rayless yellow flowers. The genus is represented in Europe, N. and S. Africa, temperate and cold Asia, and N. America. Common T. (*T. vulgaris*) has long had a reputation as a medicinal herb, causing it to be much grown in gardens in the past. It possesses bitter, tonic, vermifuge, and febrifuge properties. The plant is a native of Northern Europe, Siberia, and N.W. America, and occurs in a wild state in Britain, but as met with along the sides of streams, &c., is often of garden origin. It now holds a place in gardens mainly for the young leaves, which are shredded down and employed to flavour puddings, omelets, and cakes. A variety with leaves doubly curled is generally preferred. T.-tea enjoys a rustic reputation as a stomachic.

Tan'talum (Ta = 182), a rare metallic element, discovered in 1803 by Ekeberg, in the Swedish minerals tantalite and yttro-tantalite. On the authority of Wollaston, it was long believed to be identical with Columbium or Niobium (q. v.); but their separate identity was established by Rose in 1846.

Tan'talus, a mythical king of Lydia or Phrygia, son of Zeus. Having divulged the secrets of his father, he was doomed in the nether world to stand, tormented by intense thirst, in a lake of water which receded whenever he stooped to drink, and under bunches of grapes which were withdrawn whenever he tried to grasp them. From T.'s name comes the English 'tantalise.'

Tántia Tópi ('the weaver who became an artilleryman'), the most energetic of the rebel ringleaders during the Sepoy Mutiny of 1857. He commenced as a lieutenant of Nana Sahib (q. v.), of whom he is said to have been a relation; but after the latter had fled into Nepaul, he continued the war for several months, retreating with great rapidity through Bundelcund and Central India, but was finally captured, tried, and hanged in April 1859. T. T. was the last armed rebel in the field.

Tántrás (from Sanskrit *tan*, 'to believe'), a body of Sanskrit religious writings, which, though much later in date than the Vedas, and presumably later also than the Puranas (q. v.), have at the present day the greatest influence on Hindu opinions and observances. They all take the form of a dialogue between Siva and his wife Durgah or Parvati, and inculcate mystic and impure ceremonies in honour of the latter goddess.

Tantum Ergo, the hymn sung in the Roman Catholic Church at benediction with the Holy Sacrament.

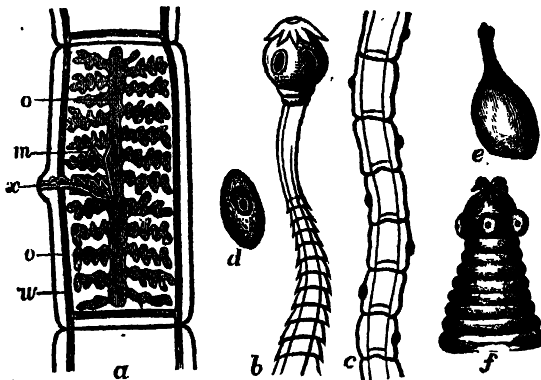
Taormi'na, a town on the E. coast of Sicily, occupies a hill 900 feet above the sea, 30 miles S. of Messina by rail. The chief buildings are the *Palazzo del Duca di S. Stephano* (14th c.), and the *Badia*, a Gothic building. There is a Greek theatre (357 feet in diameter) in tolerable preservation. The *Castello di T.* (1300 feet above sea-level) dominates the town. There are also tombs, churches, &c., of archæological value. Pop. (1874) 2458. T. (anc. *Tauromenium*), founded by the Siculi in the 4th c. B.C., was long a Roman possession. It was taken by the Saracens in 902 and 962, by the Normans in 1078, by the French in 1676, and in 1849 by the Neapolitans under Filangieri.

Tapa'jos, a river of Brazil, rises in the Serra Diamantina, 20 miles from the headwaters of the Paraguay (q. v.), and after a northerly course of 1100 miles joins the Amazon in 35° W. longitude. The T. is a dark, wide stream, and is navigable throughout most of its length. Steamers ply on its lower course for several hundred miles.

Tap'estry is an elaborate and artistic variety of textile fabric used for the ornamentation of walls, for curtains, screens, and other hangings, and for covering seats and cushions, &c. T. is made by a process intermediate between weaving and embroidery, being worked in a web without any shuttle, the weft threads being inwrought by means of a needle. The endless variety of coloured threads necessary for the weft cannot be carried from one end of the warp to the other as in ordinary figured weaving, since that would not only involve an enormous loss of valuable thread, but would render the texture thick, heavy, and unwieldy. A partial kind of weaving with needles is therefore adopted, short lengths of thread of the special colours required being worked in at the places necessary for the design, and fastened at the back of the texture. The operations are carried on in a kind of loom in which the warp originally was stretched out in a horizontal direction, but in mediæval times a loom with a vertical frame was introduced, which came to be much more used than the low or horizontal frame. The manufacture and use of T. date from exceedingly remote times. There can be little doubt that the curtains of the Tabernacle, 'of fine twined linen, with blue and purple and scarlet, with cherubims of cunning work,' were a kind of T., and throughout ancient history there are frequent references to T. work. In early Christian times T. was extensively used for the decoration of churches and other ecclesiastical edifices, on which account the work was generally executed in connection with monastic establishments; and when in later times it began to be generally used in the houses of nobles and wealthy personages, ladies of high rank practised the art. In the reign of King Dagobert the abbey of St. Denis was hung with tapestries, *brodées d'or et garnies de perles*, and from that time to the present moment T. has continued to be in France a manufacture patronised and fostered by the reigning and governing powers, the Gobelins Factory (q. v.) and the establishment of Beauvais being under the control of the State. As early as the 11th c. English T. was famous throughout Europe, but the art did not develop in this country in the 15th and 16th centuries as it did on the Continent, where it then came more directly under the control of trained artists. T.-weaving was a source of great reputation to the city of Arras in mediæval times, the name arras having become, and even yet continuing (thanks to Shakespeare), synonymous with T. After the 14th c. pictorial backgrounds were introduced into tapestries, and the varieties and shades of colour employed were greatly extended. In the 16th c., Flemish towns, especially Lille and Brussels, became great centres of the manufacture, and it was in Brussels that the famous tapestries in the Vatican, worked from the well-known cartoons of Raphael, were produced. In the second half of the 18th c. the Gobelins work came to the front, and under the direction first of Oudry and subsequently of Boucher, 'a new departure' in T.-weaving was initiated, the object of which was, with endless shades of yarn, to reproduce exactly the effects of ordinary oil-paintings, and such still continues to be the object of the French T. artists. Lately the manufacture of T. has been revived in England, an establishment entitled the 'Royal T. Manufactory' having been erected for the purpose on land granted by the Crown at Old Windsor. Many choice works have already been executed, and the concern gives promise of becoming a grand national one. The term T. is applied to a variety of woven fabrics having a multiplicity of colours in their design, which, however, have no other characteristic in common with true T. Thus a particular kind of carpet woven with a printed warp is called a T. carpet (see CARPET), and the name is also commonly given to elaborately woven coloured curtains.

Tape-Worm (*Tænia*), a well-known genus of parasitic *Scolecida* (q. v.) belonging to the section *Platyelmia*, or that including the so-called 'flat worms.' It stands as the representative of a special division of *Platyelmia* (q. v.), that of the *Tæniada*. In this group the body of the adult consists of flattened joints, which terminate anteriorly in a head armed with minute hooklets and suckers adapted for adhesion to the mucous membrane of the intestine of its host. No mouth or digestive system is developed. The young undergo a curious and complex development, and the adult is hermaphrodite. 'Externally it presents a long, flattened, ribbon-like form, divided throughout its length into segments of oblong shape (fig. *c*), except at the anterior portion of the organism, where a rounded head (fig. *b*), supported on a series of constricted segments forming the neck, is found. The segments of the neck are small and closely set, but the succeeding joints gradually increase in size, those of the posterior extremity forming comparatively large oblong segments, each of which is loosely articulated to the neighbouring joints. The head (*b*), which consists of a small rounded body, is pro-

vided with a series of hooks and suckers, by means of which the animal adheres firmly to the mucous or lining membrane of



MORPHOLOGY AND DEVELOPMENT OF TÆNIADA.

a, Single segment (proglottis) of *Tænia solium*, magnified and enlarged, to show the branched ovary (*o o*), the generative pore (*x*), the male generative organs (*m*), and the water-vascular system (*w*); *b*, Head and neck segments of *Tænia solium* enlarged, showing the booklets and suckers; *c*. Portion of tape-worm (natural size), showing the alternating generative pores. *d*, Free ovum of *Tænia*, with the contained embryo (proscolex); *e*, *Cysticercus cellulosæ*, 'Scolex,' or encysted condition of *Tænia*; *f*, Magnified head of same, showing booklets, suckers, and constricted segments forming the neck (after Wilson).

the intestine. The segments are produced from the anterior extremity by a process of continuous gemmation or budding. Each fresh segment, as produced, occupies a position between the head and the segments previously formed; the older and most mature joints being thus situated at the posterior extremity of the body. The head thus constitutes the true animal, the various segments being regarded as sexual zoöids, or individuals produced by the asexual 'nurse,' formed by the head-segments. The mature and ordinary segments or 'proglottides' (*a*) are devoted solely to the reproduction of the animal, and contain each a complete generative apparatus, capable of producing fertilised ova, male and female elements being found in each segment. Although organically connected with each other, and by each other to the head segment, the last and most mature segments are continually being detached, and are excreted from the animal in whose interior the *Tænia* resides; but fresh and new segments are, as we have seen, being continually formed by the anterior extremity, and these gradually take the place of the segments which have fallen away.

'No trace of a digestive system is seen, the animal living by the imbibition and absorption, through the membranous walls of its body, of the nutritive juices of its host. The water-vascular system (*w*) is represented by a vessel running along each side of the body, communication between the vessels taking place by means of a transverse branch at the articulation of each segment with the neighbouring joint. The nervous system consists of two small anterior ganglia, from which filaments, proceeding to the posterior parts of the organism, are derived. The generative organs therefore occupy the greater part of each joint. The ovary, forming by far the greater bulk of the contained organs, consists of a main trunk or stem from which lateral branches are given off (*o o*). The male organ exists as a small convoluted tube (*m*) terminating in the posterior part of the segment in a minute vesicle. The efferent ducts of the generative organs open by a small pore (the *generative pore*) (*x*), situated on a minute papilla or eminence, placed, in *Tænia solium*, in the centre of the lateral margin of the segment. The position of the generative pore, varying throughout the group, has been used as a means of classifying the various members of the division. The tænia varies in length as the organism has existed for a longer or shorter period; in many instances specimens have measured many yards in length; at all times, however, the segments are produced with great rapidity, new and fresh growths continually taking place as the creature continues to exist in a favourable situation. Each segment being thus capable of producing an immense number of fertilised ova, and the number of segments being also great, it follows that a mature tænia is the receptacle of an almost incalculable progeny. But the history of the reproductive process, and the consideration of the various stages through which the ovum and embryo have to pass before the mature and adult form is attained, indicate a merciful provision of nature in thus limiting their growth, and preventing the otherwise dangerous increase of these animals.

'The stages in the life-circle of a tænia may be conveniently classed under six heads, corresponding to six distinct periods in the process of development. Beginning with the mature and sexually-perfect segments, or 'proglottides,' we find that these are being continually discharged from the alimentary canal of the animal in whose interior the tænia resides. The contained and already fertilised ova (fig. *d*) of the proglottis are liberated by the subsequent destruction and decay of the segment; and for the further development of these ova it is necessary that they should enter the alimentary canal of some warm-blooded vertebrate. Having gained admittance to the digestive system of such an animal, the external envelope of the ovum is dissolved, and the minute contained embryo is set free. Its rounded form is now observed to be armed at one point by six siliceous or flinty hooks, by means of which it bores its way through the tissues of its host until it reaches some organ, such as the liver, which forms a very noted resting-place for these creatures. Or it may take up its abode in the muscular tissues of the animal; but at any rate, and wherever its resting-place is found, the *proscolex*—as the little hooked travelling embryo is called—there develops around itself a cyst or bladder-like structure containing fluid, and constituting what is known as the *Scolex* or *resting-larva* (*e f*) of the tænia. Forms of this description, long known by the name of 'Cystic worms,' are now ascertained to be merely representatives of one of the transitionary stages in the development of tænia. Within the cyst or bladder of the scolex, the head and neck of the future worm are developed in the form of a small process growing from one of the walls of the cyst. The process of development cannot proceed further until the 'scolex' be liberated from the animal in whose tissues it thus lies buried. If, however, the flesh of an animal containing 'scolices' be swallowed by some other warm-blooded vertebrate, the further and final stages in the process of development will continue and be completed. Having thus gained access to the alimentary canal of this second host, the bladder-like cyst is next dissolved by the action of the digestive juices, and the scolex-embryo, now set free, attaches itself to the mucous membrane of the intestine by the already-formed hooks and suckers. The organism next begins to bud and to develop posterior segments, until at length the mature tænia or 'strobila,' with its lengthened train of joints or 'proglottides,' is produced; each joint being sexually mature, and capable of producing ova, which, in the course of their development, will repeat the wondrous cycle through which we have traced their predecessors and progenitors.

'In the case of the *Tænia solium* of man, the life-history of the future organisms has been ascertained with considerable exactitude. The ova liberated from the 'proglottides' may be swallowed by the sheep or pig, in which the 'proscolex' burrows its way through the tissues of either animal, to become the 'scolex.' In the pig the development of the cystic 'scolices' causes the disease peculiar to that animal, and known as 'measles.' No further change can take place in the 'scolex,' unless the pork so affected be eaten by man, in which event the 'scolex,' becoming liberated from the cyst, attaches itself to the intestinal mucous membrane, and develops into the 'strobila,' or mature tænia.

'The cystic forms or 'scolices' of one animal become thus developed into the tænia of another animal. The *Cysticercus fasciolaris*, or cystic worm of the mouse, is in this way developed into the *Tænia crassicolis* of the cat; and, in like manner, the *Cysticercus pisiformis* of the rabbit is the immature *Tænia serrata* of the dog and fox.'—Wilson's *Elements of Zoology*.

The *Tænia solium* whose life-history has just been described, is the common T. W. of man, the 'scolex' of which is obtained by man usually from underdone pork. From underdone beef man obtains another species of T. W. (*Tænia mediocanellata*), whilst another genus of T. W., the Russian T. W. (*Bothriocephalus latus*, distinguished by its larger head and by the generative pore being placed in the middle of the flat surface of the segments), also inhabits the human intestine, but occurs only on the Continent. The disease known as 'hydatids' affecting the human liver is caused by the presence of the 'scolices' of a T. W.

(*T. echinococcus*), which in its mature state infests the intestines of the dog. Thus man may serve as an intermediate or primary host for the 'scolices' of the T. W. of another animal.

The 'scolices' of T. W. are obtained by man, as already remarked, from imperfectly-cooked meat. They may also be obtained, however, from unwashed vegetable matter. The successful *treatment* of T. W. depends on the removal of the entire worm. If the 'head' be left attached to the intestinal mucous membrane, it is capable of producing another tænia by budding; hence the removal of the head is the important aim of the physician. The *remedies* most in vogue are oil of turpentine, santonin, kousso, kamela, and the extract of male fern—the last being most popular with practitioners. The treatment is begun by purgation with castor-oil or aloes, and the diet of the patient is to be kept low. After purgation, the extract of male fern is administered, one or two doses sufficing to remove the parasite. The patient is thereafter to be cautioned to exercise care in his dietary, and to use salt plentifully with his food.

Tapio'ca. See MANIOC.

Ta'pir (*Tapirus*), a genus of *Ungulate* or hoofed quadrupeds, belonging to the family *Tapiridæ*, in which the fore feet have four toes, while only three toes are developed on the hind feet. There is a small proboscis or trunk, and the skull is pyramidal. The nasal bones overhang the nasal cavity. The tail is very short. The skin is thick and hairy. There are six incisor teeth in each jaw, the canines are small, and there are fourteen molars in the upper jaw and twelve below. The American T. (*T. Americanus*), inhabiting S. American forests, has a mane. The colour is blackish brown. A second species (*T. villosa*) inhabits the Andes range. The Malayan T. (*T. Malayanus*) is larger than the preceding species. It wants a mane, and the colour is black, with a white back, rump, and belly. Another genus of *T. elasmognathus*, of which *E. Bairdii* is a familiar species, is found in S. America, and *T. Roulini* and *T. leucogenys* occur in the mountainous regions of Ecuador and the United States of Colombia.

Tapp'ing is an operation for the evacuation of a cavity overdistended with fluid. It is required in cases of ascitis and ovarian dropsy, to relieve the patient from the distress caused by distension. T. is usually performed in the linea alba, about halfway between the umbilicus and pubes, but the site may vary in cases of encysted dropsy, care being taken to avoid the course of the epigastric artery. It is also used in hydatid tumours of the liver, in hydrocele, in pericardial dropsy, in hydrocephalus, and for the relief of empyema and other effusions in the cavity of the pleura. The operation may be performed by the trochar and canula, or, better still, by means of the aspirator. When performed by the aspirator no air is admitted.

Tápti, a river of India, which flows from E. to W. across the centre of the peninsula, S. of the Satpura Mountains. It rises in the native state of Betul, and after a total course of 441 miles, first through the Central Provinces, and then through the Bombay plains of Khandesh and Gujerat, falls into the Bay of Cambay a little S. of Surat. It is only navigable in the lower portion of its course, and there also can it alone be used for artificial irrigation. In the upper portion, its narrow valley, which is naturally very fertile, is shut in between steep hills. Total area of drainage basin, 27,000 sq. miles.

Tar is a product of the destructive distillation of various organic substances; but the tars of commerce are obtained 1st from the distillation of coal, &c. for gas (gas T. or coal T.), and 2d from the distillation of wood (wood T.). Gas or coal T., which was formerly regarded as a troublesome and almost useless bye-product of the gas manufacture, is now a substance of so much value that it is second only in importance to the gas itself. As obtained in gas-works, gas T. is a dark-coloured ill-smelling heavy liquid of extremely complex chemical character, consisting of a mixture of fluid and solid hydrocarbon, acid, and basic substances. Its value in recent times has arisen almost entirely from the fact that it is the source of the wide range of important dyeing substances, which, derived from aniline, phenol, (carbolic acid), and anthracene respectively, may all be classed as T. colours. Coal naphtha obtained by distillation from coal T. is a mixture of several hydrocarbons of different degrees of volatility, the lightest being benzol and toluol, and the earlier part of the distillate is composed of a mixture of these two, and that part is utilised for the preparation of aniline as the basis of the Aniline Colours (q. v.). The material remaining in the retort after the light oils are distilled over constitutes artificial asphalt, but this on further distillation at a higher heat gives off 'heavy oils,' leaving in the retort pitch, a substance which when cold is hard, black, and shining, and breaks with a glassy fracture. The principal constituents of the heavy oil are carbolic acid (phenol), cresylic acid (cresol), and in the later stages of the distillatory process anthracene is obtained. All these substances are industrially important, carbolic acid not only as an antiseptic and disinfectant, but also as the basis of valuable dyes, and anthracene as the source of the now most important dyeing agent, artificial alizarine.

Wood T. is obtained as a bye-product in the destructive distillation of wood for the manufacture of pyroligneous acid (wood vinegar), and methyl alcohol (wood spirit). It is in the same way obtained in Northern Europe in connection with the preparation of wood charcoal, but the greater part of the T. of commerce (Stockholm T., Archangel T., &c.) is obtained by a very rude and wasteful process. A pit about 9 feet deep and 10 feet of surface diameter is prepared, the sides of which are lined with clods, and into this the wood to be distilled is piled. Air is admitted to the pit by channels passing down to its lower end, and in the best constructed pits there is a pipe for conveying away the incondensible gases, and a receptacle in which the T., &c., condense. Fir wood is principally distilled, it yielding from 13 to 14 per cent. of T., while non-resinous wood yields not more than 9 or 10 per cent. The condensed liquid contains wood vinegar and oil of turpentine; and, on re-heating, these more volatile products are driven off. When the second distillation is forced, a solid black resinous residue is obtained, which constitutes common pitch. Wood T. has several constituents in common with coal T.; its most characteristic fluid ingredients being hydrocarbons with methylic acetate, acetone, eupione, and creosote, with solid resinous matters, paraffin, anthracene, chrysene, &c. It possesses valuable antiseptic properties, chiefly owing to the creosote it contains, whence its principal value for most purposes is derived. In addition to its various uses in the arts for coating and preserving timber and iron in exposed situations, and for impregnating ships' ropes and cordage, it has various applications for external use in medicine owing to its antiseptic properties.

Ta'ra, a Tahiti name for *Colocassia macrorrhiza*, a species of *Araceæ* possessing the acrid properties pervading that order, yet supplying one of the principal articles of diet in the Sandwich Islands. This is obtained from the large starchy rootstock of the plant, which by washing and cooking is rendered an innocuous, pleasant, and nutritious food. The name T. is likewise given to the allied *Caladium esculentum*, of which both the tuberous roots and the leaves are similarly utilised (see COCCO).

Ta'ra Fern is *Pteris esculenta*, the rhizome of which, prior to the colonisation of New Zealand and the introduction there of the potato and corn, formed a great part of the food of the native population. The rhizome was collected from rich ground, cut into pieces about 9 inches long, and stacked for future use. When so required it was washed, dried in the sun, and roasted.

Tarana'ki, a county and formerly a province of New Zealand, situated on the W. coast of the N. Island. It has an area of 3495 sq. miles, two-thirds of which is forest, and possesses an amazingly fertile soil, but settlement has been retarded by the lack of a harbour and by hostilities with the Maoris. The coast is lined for many miles by a deposit of titaniferous iron sand, from 2 to 5 feet deep, from which steel of the finest quality has been made. The pop. of the county at the census of 1878 was 9463, and that of New Plymouth, the chief settlement, 2680. The district derives its name from the remarkable extinct volcano called by the Maoris T., and by Europeans Mount Egmont.

Tarann'on Shales, a series of dark-coloured beds, attaining a collective thickness of nearly 2000 feet. They occur in Radnor and Montgomeryshire, occupy an intermediate position between the Llandovery and Wenlock formations, and are almost destitute of fossils.

Tarantell'a, a rapid Neapolitan dance in $\frac{6}{8}$ time, usually accompanied by the tambourine. The word is derived from the *tarantula* spider.

Tar'antism (Lat. *tarantula*, 'a ground-spider') is a peculiar disease which prevailed epidemically during the Middle Ages, the most prominent characteristics being leaping and dancing. T. was first described by Nicholas Perotti in the middle of the 15th c. It was a matter of common belief that T. was caused by the bite of the tarantula, a ground-spider common in Apulia. Those who were bitten generally fell into a state of melancholy, and appeared to be stupefied and scarcely in possession of their senses. This condition was, in many cases, united with so great a sensibility to music, that at the very first tones of their favourite melodies they sprang up, shouting for joy, and danced on without intermission, until they sank to the ground exhausted and almost lifeless. In others, the disease did not take this cheerful turn. They wept constantly, and, as if pining away with some unsatisfied desire, spent their days in the greatest misery and anxiety. Others, again, in morbid fits of love, cast their longing looks on women; and instances of death are recorded, which are said to have occurred under a paroxysm of either laughing or weeping. Perotti describes it not as a new disease, but as one well known in Apulia. T. was at its greatest height in Italy in the 17th c., and it was customary for whole bands of musicians to traverse Italy during the summer months, the cure of T. in the different towns and villages being undertaken on a grand scale. See Hecker's *Epidemics of the Middle Ages* (Lond. 1844; trans. for New Sydenham Society).

Taran'to, a town in the province of Terra d'Otranto, Italy, on the Gulf of T., 72 miles S. of Bari by rail. A large arm of the sea, 6 miles long and 2 broad, runs up N.E. from the Gulf, and T. is built on a rocky oblong islet in the middle of this inlet. The town is closely built, and is intersected lengthwise by three parallel narrow streets. In the centre a long street runs N.W. and S.E. To the N. is the Strada Garibaldi, near the Mare Piccolo, which abounds in fish. This street is inhabited by fishermen, who speak a peculiar dialect which still bears the mark of their Greek origin. On the S. shore the Strada Vittorio Emanuelo forms the newest portion of the town. In the centre of the town is the Cattedrale de San Cataldo, in the S.E. corner the Castello (erected by Karl V.), and on the peninsula to the E. of the modern city are ruins of an ancient circus, ancient villas, &c. Over this ground modern villas are once more extending. The S.E. end of the island on which T. stands was formerly attached to the mainland, with which it still communicates by means of a bridge. At its other or N.W. extremity also a long bridge unites it with the mainland and prevents vessels of any size from taking advantage of the safe anchorage afforded by the *Mare Piccolo*. The trade of T. consists chiefly in the vegetable products of the fertile neighbourhood, and in the fish and oysters which are procured in great quantities from the Mare Piccolo. In 1877, 36 British vessels of 12,139 tons, chiefly engaged in the oil trade, entered and cleared from T. The exportation of oil was 4768 tons, of which 3094 went to Great Britain. The total value of imports (Consular Report for 1878) was £28,000, and of exports £380,000. Pop. (1877) 28,739. T. (Lat. *Tarentum*, Gr. *Taras*) was originally a Greek colony founded by Spartan emigrants under Phalanthus in B.C. 708, and in consequence of its splendid harbour rose to be the greatest city of Magna Græcia. At constant war with their neighbours, the Tarentines gradually extended their territory. They first came into contact with the Romans at the close of the 4th c. B.C., and concluded a treaty with them in 302. This peace, however, was broken in 281, when Pyrrhus (q. v.) came to the aid of the Tarentines, who after a protracted struggle surrendered to Rome in 272. During the Punic Wars Hannibal coveted the city, and it was betrayed to him in 212. In 209, however, it was recaptured and plundered by the Roman general Fabius. After this it sank into insignificant tranquillity. On the fall of the Western Empire it was successively taken by Goths, Lombards, and Saracens, but was occasionally attached to the Eastern Empire. It was united to Naples by Robert Guiscard in 1063.

Taran'tula (*Lycosa tarantula*), a species of Spider (q. v.) inhabiting the S. of Europe, and notable for the supposed effects of its bite on the human organisation in inducing a kind of maniacal excitement and dancing. The name is derived from the town of Taranto in Italy, where this creature is common. The T. belongs to a group of spiders forming the family *Lycosidæ*, or that of the wolf-spiders. The body is covered with a fine down, and the legs are long and hairy.

Tarare, a town of France, department of Rhone, on the Tardine, among the Beaujolais mountains, 21 miles N.W. of Lyon by rail. It has two fine churches of the Madeleine and St. André, and manufactures fine muslins, tarlatans, plush, velvets, and other textures, to the value of 7,000,000 francs yearly. Pop. (1876) 14,569.

Tarascon, a town of France, department of Bouches-du-Rhone, on the Rhone, opposite Beaucaire, 13 miles S.E. of Avignon by rail. It has a church of St. Martha (1187) and an old rock-perched castle, built by King René in the 15th c. There are large industries in linens, woollens, cottons, silks, leather, brandy, oil, and vinegar. The neighbourhood produces teasels, madder, almonds, &c. Pop. (1876) 13,489.

Taraxacum. See DANDELION.

Tarazo'na (the ancient *Turiaso*), an old town of Spain, province of Zaragoza, on the Queiles, an affluent of the Ebro, 12 miles S.S.W. of Tudela. It has a fine cathedral with a spire of brick. Pop. 6400.

Tarbagatai', a town in Chinese Turkestan, near the Russian frontier, situated in a fertile plain 170 miles E. of Lake Balkash. It is the emporium of an extensive commerce between China and Russia. Pop. 3000, besides a garrison of 1000 men.

Tarbes, a town of France, department of Pyrenees-Hautes, on the Adour, 100 miles S.W. of Toulouse by rail. It has a cathedral (12th c.). The castle of the Count of Bigorre is now used as a prison. T. is a central depôt for the French artillery. It is an entrepôt for Spanish trade, and has manufactures of wool, flax, paper, playing-cards, &c. Pop. (1876) 21,293. A bishopric was founded here in 470.

Tare, an obscure word that from a wide application to species of *Lathyrus*, *Ervum*, and *Vicia* growing among corn, is now generally limited in botanical books to the genus or subgenus *Ervum*, and is by the farmer applied to the cultivated Vetch (q. v.). Of *Ervum* the most important species is *E. Lens*, which yields a 'pulse,' used boiled either whole or split, or ground and mixed with flour. The legumes are also eaten as a vegetable. The smooth T. and the hairy T. (*E. tetraspermum* and *E. hirsutum*) are frequently met with in cornfields, about hedges and waste places in Britain. The 'tares' of the New Testament are believed to be Darnel-grass.

Tare and **Tret**, in commerce, are certain deductions made from the gross weight of goods. The former is made by taking into account the weight of the packing, and may be *real* when the true weight of the packing is known, or *average* when it is estimated from similar known cases, or *customary* when a uniform value is deducted. The *tret* is a deduction of 4 lbs. in every 104 lbs.—*i.e.*, $\frac{1}{26}$th of the weight *less the tare*—for the waste which certain kinds of goods are liable to from dust.

Tar'get, a mark set up to be fired at: also a synonym of *targe*, a small shield formerly in use. An archery T. consists of leather or canvas stuffed with straw, and painted with concentric rings of different colours. The centre circle is golden, and surrounding it are rings of red, white (or blue), black, and white again, with a green border. A T. for rifle practice is formed of plate iron. In the British army, an oblong plate, measuring 6 feet high and 2 feet broad is designated a T.; it is only used for skirmishing practice. Two such targets are erected side by side for 'third-class' shooting (distances up to 300 yards); three for 'second-class' (distances 300 to 600 yards); and four for 'first-class' (distances 600 to 800 yards). The divisions on the targets are three in number, viz. 'bull's-eye,' 'centre,' and 'outer.' The first is indicated by a black circle, and the second by a black ring painted on the white ground of the T.: all outside of the 'centre' ring constitutes the 'outer.' The value in marks attached to the 'bull's-eye' is 4, to the 'centre' 3, and to the 'outer' 2. The dimensions of the divisions and the T. for different classes are as follows:—

Name of Division.	Dimensions of Divisions, and T.		
	Third-Class (up to 300 yards).	Second-Class (300 to 600 yards).	First-Class (600 to 800 yards).
Bull's-Eye.	1 foot diameter.	2 feet diameter.	3 feet diameter.
Centre.	3 feet ,,	4 ,, ,,	6 ,, ,,
Outer.	Remainder of T.	Remainder of T.	Remainder of T.
	6 feet by 4 feet.	6 feet square.	6 feet by 8 feet.

Hits are signalled by a 'marker' from an iron mantlet at the side of the targets. Without exposing himself he indicates by means of a disc mounted on a pole the position of the hit. A white disc denotes a 'bull's-eye,' a red disc a 'centre,' and a black disc an 'outer.' Simultaneously with signalling, the marker effaces the bullet-mark with a paint-brush fixed behind the disc. A *ricochet, i.e.*, a shot which strikes the ground before the T., is signalled by waving a red flag horizontally in front of the T., and it is registered as 'R.' The targets adopted by the National Rifle Association at Wimbledon, and by affiliated associations throughout this country, differ from military targets. Wimbledon targets have four divisions, called 'bull's-eye,' 'inner,' 'magpie,' and 'outer,' and the value in marks attached to each is respectively, 5, 4, 3, and 2. The signalling disc for a 'bull's-eye' is coloured white, for an 'inner' red, for a 'magpie' black and white, and for an 'outer' black. The dimensions of the divisions of the Wimbledon targets for 1878 were as follows :—

Designation of Division.	Dimensions of Divisions of Wimbledon Targets (1878).		
	At 200 yards.	At 500 and 600 yds.	At 800 to 1000 yds.
Bull's-Eye.	8 inches in diam.	2 feet in diam.	3 feet in diam.
Inner.	1 foot ,,	3 ,, ,,	4½ ,, ,,
Magpie.	2 feet ,,	4 ,, ,,	6 feet square.
Outer.	Remainder of T. 4 feet square.	Remainder of T. 6 feet square.	Remainder of T. 12 feet by 6 feet.

Targowitz', a small town (pop. 2000) in the government of Kiev, Russia, noted for the T. 'Confederation' or plot formed here (14th May 1792) by five Polish nobles, who were instigated by Catherine II. Its object was the overthrow of the new constitution, and it led to the second partition of Poland (q. v.).

Tar'gums ('translations,' from Aramaic *tirgêm*, 'to translate, explain') are the Chaldee paraphrases and versions of the Old Testament. In the post-exilian times, as Hebrew gradually became unknown to the common people, the public reading of the law was accompanied by an oral paraphrase (*cf.* Nehemiah viii. 8). This custom received a great impulse as the synagogue system gained prevalence, and the T., though long preserved by mere oral transmission, may have begun to be fixed in writing as early as about 50 A.D. None of the extant T. covers the whole Old Testament, but from one and another we have versions of all the books except Ezra and Nehemiah. Onkelos, to whom the oldest of these, a targum on the Pentateuch, is attributed, was, according to the Talmud, a proselyte, the pupil and friend of the Gamaliel who died not long before the destruction of the Temple. His targum, in general plan at least, was probably extant before 50 A.D. Its language resembles the Biblical Chaldee, and is almost quite free from traces of late idiomatic corruptions. As a translation it is faithful, generally very literal, gives often clever explanations, and errs, as a rule, only in obscure passages. Explanatory additions of any length are mostly confined to the poetical portions; and alterations of the text, due to Jewish opinions and theological presuppositions, are mainly mere substitutions for anthropomorphisms and the like, so that this targum may fairly be styled a translation, not a paraphrase, and its author must have possessed a strong exegetical tradition. Jonathan ben Uziel, the reputed author of the targum on the *prophetæ priores et posteriores*, is said to have been a pupil of Hillel. But this targum is certainly much later than that of Onkelos, being far less pure in idiom and much more paraphrastic. Even the historical books are often expounded, and in the prophets the exposition frequently almost passes into an actual Haggada (q. v.). Next we have two T. on the Pentateuch in a Jewish-Aramean dialect which approaches Syriac, and has many foreign elements. One of these, which is complete, is ascribed to Jonathan ben Uziel; the other, in appearance a mere collection of fragments, is styled the 'Jerusalem Targum.' The former rests entirely upon the targum of Onkelos, but is, besides, a compendium of all the Halachas (q. v.) and Haggadas (q. v.) on the text. The theology, angelology, historical allusions—in short, the entire colour and contents—point not to Jonathan's time, but to a date not earlier than 750 A.D. The Jerusalem targum is probably not so much the remnant of a paraphrase earlier than the pseudo-Jonathan, as a Haggadic supplement and collection of marginal glosses and variations upon Onkelos. It is older than the pseudo-Jonathan, and resembles the Mishna (q. v.) in dialect, as the latter does the Talmud (q. v.). As regards the T. on the Hagiographa, traditionally ascribed to Joseph the Blind, Psalms, Proverbs, and Job are probably of the same age and of Syrian origin; that on the five Megilloth (Canticles, Ruth, Lamentations, Ecclesiastes, Esther) is probably by one author who flourished later than the Talmudic epoch, and wrote in a dialect midway between east and west Aramaic. This targum is less a translation than a continuous Haggadic commentary. Of similar Haggadic character and late date is the targum on Chronicles. That on Daniel contains manifest allusions to the Crusades, and belongs probably to the time of the brief Christian rule at Jerusalem in the 12th c. A targum on the apocryphal portions of Esther may merely be mentioned. See article 'Thargumim' in Herzog's *Real-Encyclopädie für Theologie und Kirche*; Emanuel Deutsch, *Literary Remains*; Jost, *Geschichte des Judenthums und seiner Sekten* (1857-59); Grätz, *Geschichte der Juden*.

Tari'fa, a seaport of Spain, province of Seville, the most southerly town of Europe, on the Strait of Gibraltar, at Punta Marroqui, 20 miles S. W. of the town of Gibraltar. It is thoroughly Moorish in aspect, dingy and crowded, girt with embattled walls, and defended by an old castle and a modern fort, the latter situated on the Isleta de T., with which the town is connected by a causeway. The harbour is shallow, but T. has important anchovy and tunny fisheries. Pop. 12,000. The Carthaginian *Josa* and the Roman *Julia Traducta*, the town is said to have been named by the Moors after Tarif Ibn Malik, who landed here before the conquest of Spain to reconnoitre. It was held by the English against a strong French force under Laval and Victor in 1811.

Tar'iff, a table showing the rate of duties, bounties, and drawbacks charged on goods imported or exported from one country to another. The name is derived from the Moorish port of Tarifa (q. v.), where duties were levied on African commerce. Tariffs are regulated according to fluctuations of trade and the relations of international commerce. At present the British T. imposes no export duty, and an import duty on only twenty articles. In the United States the term is exclusively applied to a law of Congress fixing the import duties.

Tar'latan, a light, thin, cotton fabric used for ladies' dresses, &c. It is imported into England from France and Switzerland. Tarare (q. v.), in France, is the principal seat of its production.

Tarn, a department in the S. of France, in the basin of the T., a tributary of the Garonne. Area, 2216 sq. miles; pop. (1876) 359,232. The southern half is occupied by mountains of the Cevennes system, but affords good pasturage and building timber; the northern half is level. T. yields abundant crops of pease, wheat (2,512,000 bushels in 1876), and fruit, and breeds good sheep, swine, and geese. Coal, iron, marble, and gypsum are found in the soil. There is some weaving. The capital, Albi (q. v.), gave name to the Albigenses (q. v.), and 12 per cent. of the population are still Protestants.

Tarn-et-Garonne, a department in the S. of France. Area 1436 sq. miles; pop. (1876) 221,365. It is a level plain crossed by slight hills and watered by the Garonne. The country is fruitful and well tilled, and produces excellent wheat (3,644,000 bushels in 1876) and corn, pease, vegetables, tobacco, flax, and hemp. Horses and cattle are largely reared. Coal, marble, iron, &c., are found. Woollen, cotton, silk-hosiery, and quill-pen manufactures, together with the making of wine and brandy, are the chief industries. Of the population 16 per cent. are Protestant. Montauban (q. v.) is the chief town.

Tarno'pol, a town of Galicia, Austria, on the Sereth, 87 miles S.E. of Lemberg by rail. It has a Roman Catholic and a Greek church, a Jesuit college, upper gymnasium, &c. There is considerable trade in corn and other agricultural products. A great horse-market with horse-races is held annually. The pop., of which one-half are Jews, was (1870) 20,087.

Tarnov', a town of Galicia, Austria-Hungary, 47¾ miles E. of Cracow by rail on the navigable river Dunjec, not far from the mouth of the Vistula. It is the seat of a bishop, and has a town-house and cathedral with curious statues of the princes of Ostrog and T. The chief trade is in corn, linen, leather, and timber. Pop. (1870) 21,779, of which one-third were Jews.

Tarpau'lin, a waterproof covering formed of canvas coated with tar and dried. It is employed to cover hatchways, boats,

&c., on shipboard, and also to protect agricultural produce, roofs in process of construction, goods in transit, and other articles, from the effects of the weather.

Tarpei'an Rock, the western cliff of the Capitol in Rome. Once, when the Sabines besieged Rome, Tarpeia, daughter of the Roman general, offered to show them a secret entrance for what they wore on their left arms—meaning their bracelets. They accepted her offer; but, to punish her perfidy without breaking their promise, crushed her with their shields. The spot was hence called the T. R., and persons accused of aiming at the 'restoration of the monarchy,' *i.e.*, of despotism, were thrown from it. In the garden of the so-called *Casa Tarpeia*, on the Monte Caprino, is still shown a *Rupe Tarpeia*.

Tarquin'ii, The, according to the Roman legend which once passed for history, were a noble Roman family of foreign origin. Its chief members were **Lucius Tarquinius Priscus**, fifth king of Rome, who came from the Etruscan city of Tarquinii. His wealth and ability soon procured him influence in his new home. He became intimate with Ancus Martius, the reigning monarch, and at length succeeded to the throne. He reigned for thirty-eight years, and increased the power of Rome abroad and her splendour at home. He conquered in war the Latins, Sabines, and Etruscans. To him is ascribed the construction of the vast sewers (*cloacæ*), which still remain intact, of the Circus Maximus, the Forum, and the Capitoline Temple. He is also credited with several important changes in the constitution of the state. In the midst of his power he was murdered by the sons of Ancus Martius.—**Lucius Tarquinius Superbus**, seventh and last king of Rome, succeeded to power by violence, and ruled by the same. He disregarded or abrogated popular rights and privileges. He was engaged in frequent wars, and as he was a successful commander he soon made Rome the first of the Latin cities. He took the Volscian city of Suessa Pomatia and the Latin city of Gabii. He was feared abroad and hated at home, and an opportunity for that hatred to manifest itself soon occurred. Sextius, the king's son, conceived a passion for the beautiful and virtuous Lucretia, wife of his cousin Collatinus. He gratified this passion by force and fraud. The outraged wife killed herself, but not till she had made her husband and father aware of the crime of Sextius. Along with Brutus (q. v.), they roused the people by the recital of the disgraceful story, and Tarquinius and all his family were for ever expelled from Rome (510 B.C.). Tarquinius made several attempts to regain his lost kingdom; first with help from the people of Tarquinii and Veii, again with the assistance of Lars Porsena, and for the last time by the aid of the Latin states. All were unsuccessful. Finally Tarquinius retired to Cumæ, where he died.

Tarr'agon. See ARTEMISIA.

Tarrago'na (Phœn. *Tarchon*, Lat. *Tarraco*), a fortified seaport of Spain, and chief city of a province of the same name, on the Mediterranean, at the mouth of the Francoli, 63¼ miles W.S.W. of Barcelona by rail. It consists of an upper and under town; the under protected by a range of bastions fronting the Francoli, the port, and mole, while an inner line of works protects the rise to the upper town, which is built upon a limestone rock 760 feet high, is girdled with ramparts and outworks. T. has a noble Gothic cathedral (1089-1131), and many interesting Roman remains. The harbour is accessible only for small vessels, but there is a large trade in corn, wine, oil, and fruits. Pop. (1877) 19,002. T. was founded by the Phœnicians, and was the capital of the Roman province of Tarraconensis. In 1813 it was plundered by Suchet.

Tarr'ytown, a town of New York, U.S., on the Tappansee, 26 miles N. of New York by rail. It has eleven churches, two banks, and two newspapers. Major André was captured here. T. was the home (Sunnyside) and contains the tomb of Washington Irving. Sleepy Hollow is in the neighbourhood. Pop. (1877) about 5000.

Tar'shish, an important maritime city frequently mentioned in the Old Testament, is commonly identified with the Phœnician colony of Tartessus in the S.W. of Spain. Its name first occurs in Gen. x. 4, in connection with the Grecian races, and we afterwards hear of it as an important part of the Tyrian kingdom, and as exporting silver, iron, tin, lead, and precious stones. 'Ships of Tarshish' were the largest merchant vessels known to the Hebrews, and were so called either as built on the model of the T. ships (compare the English 'East Indiamen'), or if the derivation of T. from the Sanskrit *tarishna*, with the sense of 'sea,' 'ocean,' be correct, as equivalent to 'deep-sea vessels.'

Tar'sia (Ital. *intarsiatura*, 'inlaid work'), a kind of inlaid woodwork, figures and other designs being represented by pieces of differently tinted woods inlaid in panels of walnut or other wood. T. was brought to considerable perfection in Italy during the Renaissance, and was employed in decorating the choirs of churches, &c.

Tarsus, a scientific name used to denote the region popularly known as the ankle, and which in man consists of 7 bones —*os calcis* (heel), *astragalus*, *calcaneum*, *cuboides*, *naviculare*, and three *cuneiform bones*. The astragalus receives the lower extremity of the *tibia* or shin-bone, and thus assists in forming the ankle-joint. The T. of other vertebrates may differ very widely from that of man. There are as many as 9 ossicles in the T. of the salamander, and the number is reduced to 3 in serpents.

Tar'sus, the ancient capital of Cilicia, on the Cydnus, 12 miles above its mouth, and nine hours' journey from Adana. Traditionally founded by Sardanapalus, it is first mentioned by Xenophon as captured by Cyrus. After passing successively under the dominion of the Seleucidæ and Ptolemies, it was made by Pompey the capital of a Roman province (66 B.C.). Here Alexander caught a fever from bathing in the icy Cydnus (333 B.C.), and here Cleopatra was royally received by Antony (41 B.C.), who conferred on T. the Roman franchise. Under the Romans T. rose to be a great seat of philosophy and a place of much commercial importance. It was the birthplace of St. Paul and of seven Stoic philosophers, and here the emperors Tacitus and Maximinus died. Since its capture by the Saracens it has gradually declined, and is now a small dirty town (*Tersus*), with no remains of its former grandeur, and a pop. of 12,500.

Tar'tan (derivation uncertain), a woven cloth having chequered patterns in various colours. It was formerly much worn in Scotland, and certain patterns are still known by the names of the various Highland clans who adopted them. 'Fancy' tartans have of late years somewhat destroyed the individuality of the 'clan' tartans. T. was originally and is still extensively made of wool, but other fibres, such as silk, are now also used. Tillicoultry, Bannockburn, &c., are noted seats of the Scotch T. manufacture.

Tar'tar, Cream of, or **Acid Tar'trate of Po'tash**, is used in medicine as a cathartic, diuretic, and refrigerant in febrile and dropsical affections, and in acute desquamative nephritis. As a refrigerant or diuretic it may be given in doses of from 20 to 60 grains; as an aperient, 60 to 120 grains; and as a cathartic, in doses of from ½ to 1 ounce.

Tartar'ic Acid ($C_4H_6O_6$), the most important of vegetable acids, occurs in many fruits, especially the grape. During fermentation the juice of the grape deposits the substance known in commerce as *tartar* or *ergol*. This substance, essentially the bitartrate of potash, is hardly soluble in cold water, but may be crystallised by cooling from its solution in boiling water. Thus purified it is known as *cream of tartar*, having the composition $KHC_4H_4O_6$. This salt is acid to test-paper, and from it the neutral salt ($K_2C_4H_4O_6$) may be obtained by evaporation of the solution of the bitartrate previously neutralised with potash. The crystallised T. A. resembles this salt in composition, having hydrogen instead of potassium. To prepare it, the impure bitartrate is boiled in water, and carbonate of lime added as long as effervescence continues, indicating the escape of carbonic acid. The action results in the formation of the insoluble tartrate of lime, and the soluble tartrate of potash, and then by the addition of chloride of calcium the potassium is replaced altogether by the lime, chloride of potassium appearing in solution. The lime salt is then strained and boiled with dilute sulphuric acid, when sulphate of lime remains undissolved, and from the filtered solution T. A. may be obtained in transparent prismatic crystals by evaporation. The acid is soluble in about three-fourths of its weight in hot water. When kept, this solution is found to deposit a fungoid growth, acetic acid at the same time appearing in the solution. Crystals of T. A. fuse at 182° C. without loss of weight, but the fused mass is found to consist of a mixture of two new acids which are uncrystallisable. The one, *metatartaric*

acid, has apparently the same formula as T. A., and its salts the metatartrates are more soluble in water than the tartrates, and may be converted into the latter by boiling. The other acid, *isotartaric acid*, has the constitution $HC_4H_5O_6$; and its salts, also much more soluble than the tartrates, may be similarly converted by boiling. At 190° C., T. A. loses water, and is converted into a white insoluble substance known as tartaric anhydride ($C_8H_8O_{10}$). The most important of the salts of T. A. is the double tartrate of antimony and potash, commonly called tartar emetic. It is prepared by digesting cream of tartar with teroxide of antimony, which has been prepared by boiling antimony with sulphuric acid. From the boiled filtered solution octahedral crystals are deposited, having the composition $2(KSbOC_4H_4O_6)$ Aq. The water of crystallisation is expelled at 100° C. At 260° C. an additional molecule of water is lost, but the new salt ($KSbC_4H_2O_6$) may be reconverted into tartar-emetic by dissolving it in water. Compounds analogous to tartar-emetic have been obtained in which antimony is replaced by borax or arsenic, and potassium by silver lead or sodium. Rochelle Salt (q. v.) is a double tartrate of potash and soda, prepared by neutralising cream of tartar with carbonate of soda. By deoxidation T. A. may be converted into malic and succinic acids, which have the compositions $H_2C_4H_4O_5$, and $H_2C_4H_4O_4$ respectively; and these by suitable means may be reconverted in T. A.

Tar'tars or **Ta'tars** (from a Turanian root signifying 'to stretch' or 'to pitch a tent'), the name originally of the Mongolian races, but since the conquests of Chingis-khán (1227) extended to all the tribes under Mongolian sway. Promiscuously applied by mediæval chroniclers to the nomadic bodies that in the 13th c. burst upon Europe from the Asiatic steppes, it owes its rise to a fancied connection with *Tartarus*, the bottomless pit, whose opening, as foretold in the Apocalypse, was now as it seemed fulfilled. '*Tartari, quasi tartarii, exeuntes ad instar dæmonum solutorum a tartaro*,' says Matthew Paris (*Hist. Major*, p. 546). By philologists the term Tartaric is sometimes loosely applied to the entire Turanian family of languages, but usually it is restricted to that class of Turanian Languages (q. v.) of which Turkish stands as the type.

Tar'tarus, according to Hesiod, was the son of Æther and Gæa, and father of the giants Typhœus and Echidna. In the *Iliad*, T. is a place as far beneath Hades as heaven is above the earth—a dark desolate region into which Jews hurled the rebel Titas. Afterwards the name was sometimes used as a synonym of Hades, but more frequently to denote a place of punishment.

Tar'tary, the geographical name of the empire of Chingis-khán and his successors, applied during the Middle Ages to the central parts of Asia and eastern Europe from the Sea of Japan to the Dnieper, but subsequently restricted to Turkestan (q. v.) in Asia, and chiefly to the Crimea (q. v.) in Europe.

Tartuffe', the name of the chief character in what is generally recognised as the finest of Molière's comedies, has come to be synonymous with 'hypocrite' throughout the world, just as 'Pecksniff' is in English-speaking countries. The character of T. was probably suggested by a certain Abbé Roquette, a parasite of the Prince of Conti, and the great 'situation' of the piece (act iii. scene 6) was borrowed from a novel of Scarren's, who again borrowed the idea from a Spanish work. The origin of the name T. is connected by a rather apocryphal anecdote with the Italian word *tartufi*, meaning 'truffles.' The priests, with a fine instinct for 'putting on the cap where it fitted,' considered themselves deeply aggrieved by the character of T.; and though the comedy was written in 1664, it was not till 1669 that Molière obtained permission to perform it publicly and in full. When it was at last produced it ran for three months. An English adaptation of it by Bickerstaff still holds the stage under the title of *The Hypocrite*, 'Dr. Cantwell' being the name given to the English T.

Tashkend, the chief town and military headquarters of Russia in Turkestan (q. v.), situated in a fertile, orchard-covered valley, at the foot of the Alatan and Chatkal mountains, and on the Saralka, a feeder of the Djirhik, which joins the Sir-Daria 165 miles above fort Chulak. The old city, 7 miles in circuit, is girt with a mud wall, pierced by nine gates. It has 270 *maals*, 310 mosques (partly in ruins), 17 colleges, 11 baths, 15 bazaars filled with shops, and two rivulets are distributed through it by many canals, which also serve various mills. The Russian city is regularly built, and has broad, well-lighted streets, lined on both sides with streamlets and rows of shady trees. The Russian citadel, an immense structure, comprises barracks and magazines, and is defended by a bastioned wall. One of the largest cities of Central Asia, T. has long been the centre of an important trade. Here converge roads from Kashgar, Samarcand, Orenburg, and Siberia. The trade is mainly in cotton fabrics, metal wares, and silk, and in the second half of of 1873 the value of foreign goods exchanged amounted to 10,600,000 rubles. A great caravanserai has been recently erected for the wholesale trade. Pop. (1871) 76,072, of whom 46,000 are Sartees, some 3000 Russians, and the rest Kirghis, Usbegs, and Jews, the last occupying a separate quarter. T., the *Shash* of the Middle Ages, was the capital of the Kirghis Cossacks from the 16th c. It was occupied in 1810 by the Khan of Khokan, from whom it was taken by the Russians, 12th September 1867. General Kaufmann has here his residence.

Tas'man, Abel Janssen, a celebrated Dutch navigator, was born probably at Hoorn, about 1600. Commissioned by Van Diemen, the governor of the Dutch Indies, to explore the S. coast of the Australian continent, he left Batavia with two ships, August 14, 1642, passed Mauritius October 8, and on November 24 discovered a coast which he called Van Diemen's Land, but which is now known as Tasmania. He sailed along its S. and E. coasts without being aware of its insular character, and proceeding further E. discovered (December 13) the southern island of New Zealand (January 6), the Fiji Islands, returning to Batavia, June 15, 1643. His account of this voyage was reprinted at Amsterdam in 1722. On the 29th January 1644 he set out on a second voyage to explore the coasts of New Guinea and Australia, from which he never returned.

Tasma'nia, formerly called **Van Diemen's Land**, an island forming a British colony, and lying to the S. of Australia, from which it is separated by Bass Strait (q. v.). It is situated between 40° 33'–43° 33' S. lat. and 144° 30'–148° 30' E. long., is heart-shaped, and its greatest measurements are 210 miles from N. to S. and 190 miles from E. to W. Including fifty-five smaller islands adjoining it and subject to its government, T. has an area of 26,215 sq. miles, or more than four-fifths of that of Ireland. The coast is bold and rocky, and in the S.E. is broken by a number of large bays and inlets, of which the chief are Norfolk, Frederick Henry, and Storm bays, and the estuaries of the Derwent and Huon. Oyster Bay on the E., Ringarooma and Anderson Bays and the estuary of the Tamar on the N., and Macquarie Harbour and Port Davey on the W., are the other principal indentations of the coast-line. The chief islands belonging to T. are the Furneaux (q. v.) group at the eastern entrance to Bass Strait, and Hunter and Robbins Islands at its western entrance, with the very irregularly shaped Bruni Island on the S.E. coast, and Maria Island on the E.

The general aspect of T. is that of a mountainous, wooded, and well-watered country. The mountains may be divided into two systems, occupying respectively the eastern and western portions of the island, and separated by a valley which crosses its centre from N. to S. The mountains, which are usually wooded to a considerable height, abound with bold peaks, deep ravines, and grand basaltic cliffs often hundreds of feet in height. The loftiest summits in the eastern range are those of Ben Lomond (5010 feet) and Mount Barrow (4644 feet). The western mountains consist of a number of ranges diverging from a table-land 3000 feet high, and the highest peaks are Cradle Mountain (5069 feet), Mount Humboldt (5502 feet), Frenchman's Cap (4756 feet), and Ironstone Mount (4736 feet). There are many other mountains from 3000 to 4500 feet high. Geologically the mountain-ridges of T. are chiefly composed of greenstone, while in the S.W. and N.E. districts granite and quartz are found in immense masses. Sandstone, clay-slate, and limestone are abundant on the bases of the mountains and in the valleys. The chain of mountainous islands stretching from T. to Australia seems to indicate a former connection between the two. The central table-land contains several lakes, of which Great Lake, the largest, has an area of 44 sq. miles. From these lakes issue the principal rivers and their tributary streams. The largest of these, and also the largest stream in

the colony, is the Derwent, which flows S.E., as also does the Huon, and both have navigable estuaries. The E. coast has no large river, but on the N. the Forth, Mersey, and Tamar are of considerable size. The last is properly only an estuary, like the Humber in England, being formed below the confluence of the North and South Esk. It is 40 miles long and navigable. The Arthur, Pieman, and Gordon are the largest rivers draining the western slope. The Tasmanian rivers usually run in narrow valleys, have a rapid descent, and are liable to heavy floods.

The climate of T. is one of the mildest and healthiest in the world, free from extremes alike of heat and cold. In summer the hot winds from Australia are tempered by their passage across Bass Strait, while in winter snow rarely falls except on the high lands. At Hobart Town thirty years' observations show the mean temperature during summer to be 62°, during winter 47°, and for the year 54½°. At the same place the mean annual rainfall is 22·71 inches, but for the whole colony it is 35 inches, and on the W. coast it is much heavier, having reached 75 inches.

The fauna of T. resembles that of Australia, the chief indigenous mammals being the kangaroo, wallaby, wombat, and opossum. In the so-called native tiger and devil (see THYLACINE and DASYURE) it also possesses predatory marsupials which in Australia are now found in a fossil state only. The birds number 171 species, of which thirteen are peculiar to T. Insects are very numerous, and the reptiles include thirteen species of snakes, most of which are venomous, tortoises, and lizards. The sea abounds with fine fish, and whales and seals are also found, though less numerous than formerly. Salmon and brown trout have been successfully acclimatised by means of ova brought from Britain. Sheep, cattle, and horses thrive exceedingly, while rabbits have multiplied to such an extent as to become a serious pest.

The flora of T. also closely resembles that of the Australian continent, and among the principal trees which compose its magnificent forests are various kinds of eucalyptus (some specimens 300 feet high, discovered in 1877) and acacia, the Huon pine (*Dacrydium Franklinii*) sassafras (*Athermosperma moschata*), native beech, or 'myrtle,' as the settlers term it (*Fagus Cunninghamii*), and tree-ferns from 20 to 30 feet high. All English crops and fruits grow to perfection, but grapes, oranges, and lemons thrive only in favoured situations. The pastures and hedges of the island are luxuriant, and contribute largely to make T. the most English in aspect of any of the Australian colonies.

The mineral wealth of T. is great, but its development is as yet only in its infancy. For example, coal of good quality is plentiful, yet the colony is chiefly supplied from New South Wales; hæmatite iron is also abundant, and is beginning to be worked; gold to the value of £25,000 was exported in 1877, and ores of silver, platinum, copper, antimony, and bismuth are known to exist within the colony; tin is found in great abundance at Mount Bischoff, in the N.W. district, whence tin to the value of £283,118 was exported in 1877. In 1878 deposits of tin ore, reported to equal in richness those of Mount Bischoff, were discovered at Mount Heemskerk, 35 miles to the S.W. of the former mountain. With the extension of means of communication the mineral riches of the island will be speedily developed. At present the only railway lines in operation are one, 133 miles long, connecting Hobart Town and Launceston, and another running W. from the latter town to Deloraine (45 miles), whence it is being extended to the N. coast at Torquay (30 miles). There is also a tramway connecting the tin mines at Mount Bischoff with the shipping place at Emu Bay.

The total value of the imports into T. during 1877 was £1,297,886, and of the exports £1,437,793. Of the latter the principal items were wool, hides, and skins, tin, gold, cereals, jam and green fruit, timber, bark, and sperm oil. The leading industries, in addition to sheep-farming, agriculture, and mining, are jam-making, flour-milling, and shipbuilding. The public revenue for 1877 amounted to £361,000, of which sum £205,000 were obtained from customs duties. The pop. at the census of 1874 was 104,197. The capital is Hobart Town (q. v.), and the only other town of any size is Launceston (q. v.). The island is divided into 18 counties.

T. was discovered on 24th November 1642 by Tasman, who named it Van Diemen's Land, after the Governor-General of the Dutch E. Indies. The island was visited by many successive explorers, including Cook, Furneaux, Bligh, D'Entrecasteaux, and Bass, and in June 1803 it was taken possession of by Britain for the purpose of forming on it a penal settlement, subsidiary to that of New S. Wales. The early history of the colony was a wretched one, being marked by famine, conflicts with the natives, and the outbreak of bushranging, the last of which continued to be alarmingly prevalent for many years. During the first 20 years tyranny of every kind was rampant, illegal imprisonment, flogging, and even torture to extort confession, being common. In 1824 the colonists petitioned the Home Government for independence of martial law, and the request was granted them in December 1825. The discovery of gold in Australia in 1851 caused a great many of the most valuable settlers to leave T., which thenceforward fell behind in the race of colonial progress, notwithstanding the abolition of transportation in 1853. In compliance with the prayer of the colonists, the name of the colony was altered from Van Diemen's Land to T., the change taking effect on 1st January 1856. The government is now administered by a governor appointed by the Crown, and assisted by a cabinet of four ministers, who are responsible to a Parliament consisting of a Legislative Council of 16 members, and a House of Assembly of 32 members.

The aborigines of T. belonged to a Negrito race, and are pronounced by Professor Huxley to have been 'totally different' from those of Australia. He supposes that they reached T. from New Caledonia by a chain of islands now submerged. They were of a dark-brown colour, approaching black, with naturally twisting hair, while that of the Australian natives is straight. The Tasmanians were also shorter, and more robust than the latter. They wore skin mantles in winter, but went unclothed in summer. Their weapons were spears and clubs, and they were not acquainted with the throwing-stick and boomerang used in Australia. Their numbers in 1803 were estimated at 7000, but were soon reduced by perpetual hostilities with the colonists. At length, in 1830, Governor Arthur attempted to form a cordon, before which the natives should be driven into Tasman Peninsula, which is joined to the mainland by an isthmus only half a mile wide. The enterprise, which occupied 4850 men for six weeks, and cost £27,000, proved a ridiculous failure, its sole fruits being the capture of an old woman and a sick man. Subsequently a bricklayer named Robinson succeeded by moral suasion in inducing the natives to give themselves up gradually, and they were removed to Flinders Island, in Bass Strait, where they were well provided for. Nevertheless, their numbers so rapidly lessened, that in 1838 only 86 were left, and no children had been born during their exile. They were accordingly removed to Port Phillip, and eventually to the vicinity of Hobart Town, but nothing could arrest their decline, and the last representative of the race, an old woman, died on 8th May 1876. See *Daily Life and Origin of the Tasmanians*, by James Bonwick (Lond. 1870); *The Native Tribes of T.*, by J. E. Calder (Hobart Town 1875); *Report* of the Tasmanian Commission to the Philadelphia Exhibition of 1876 (Lond. 1877); *T., Past and Present*, by Sir Charles Du Cane (Colchester 1877); *The Tasmanian Almanac*, and the *Papers and Proceedings* of the Royal Society of T. published annually at Hobart Town.

Tasmann'ia, now united to *Drimys*, is a small genus of *Magnoliaceæ*, was named after the Dutch navigator Tasman, the discoverer of Tasmania or Van Diemen's Land, where *T. aromatica*, a bushy shrub or small tree, is locally abundant from the sea-level to 4000 feet up the mountains; it occurs also in the humid forest-ranges of Victoria, Australia. This species, as also *D. dipetala* of New South Wales, has received the name of 'pepper-shrub' from the colonists, their berries being made use of as a substitute for pepper.

Tassis'udon, the chief town of Bhotan (q. v.), on the right bank of the Godadda, an affluent of the Brahmaputra, has a palace for the two rajahs; the dherma-rajah lives in a high tower with a beautiful idol, the deb-rajah in a square edifice which encloses the tower. The palace is girt with rows of smithies in which the metal images are made.

Tass'o, Bernar'do, an Italian poet, was born at Bergamo in 1493, studied at Padua, and spent a long and restless life as a political agent in the service of several successive patrons, of whom Guido Rangone, Sanseverino, and Gonzaga of Mantua are the chief. He died in 1596 at Ostiglia. In Italian literature T. enjoys a secondary niche as the author of an epic, *Amadigi*, and a new interest has been associated with his name by the discovery of several hundreds of his unpublished letters by the Marchesse

Campori (1869), Portioli, and Panizza; but, after all, his memory is best preserved by the fact that he was the father of Torquato T. See *Fraser's Magazine* (1874), vol. ix.—**Torquato T.**, son of the preceding, and the fourth great poet of Italy, renowned as much by what he learned in suffering as by what he taught in song, was born, 11th March 1544, at Sorrento. While his father Bernardo was moving hither and thither, the bright and precocious boy was allowed to grow up happily in the warm atmosphere of a mother's love; but when at length his father found as he hoped a settlement at Rome, he was obliged to bid what proved to be a last, as it was a sorrowful, farewell to his mother, and make his first trial of a courtier's life. After various vicissitudes, he was sent about 1557 to Padua to prosecute the study of law under Panciroli; but he devoted the larger share of his attention to *Il Rinaldo*, an epic poem, which at length saw the light at Venice in 1562, when he was only 18 years of age. The youthful poet now formally abandoned his legal studies, and devoted himself earnestly to letters, both at Padua and Bologna. Meanwhile his father was attempting to procure him a post under some powerful patron, and at length he learned that the Cardinal Luigi (Lodovico) d'Este was willing to give him an appointment in his household. He was to meet the cardinal at Ferrara; and accordingly, in October 1565, he entered the city which had already been associated with the fortunes of Boiardo and Ariosto, and was destined to be associated with more tragic emphasis with his own. He soon acquired the favour not only of the reigning duke, Alfonso I., but also of his sisters the princesses Lucrezia and Leonora, whose praises he had already celebrated in his *Rinaldo;* and little more was required of him than that he should be what he naturally was, a pleasant companion. In 1571 he was called to accompany the cardinal to France; but he soon returned to the too attractive Ferrara, and in 1573 he formally entered the service of Alfonso. Full leisure was allowed him for his poetic occupations; and under the sunshine of the womanly admiration and encouragement which the princesses bestowed on his task, he gradually developed and completed a great epic, which he had first conceived while a student at Padua, and which was to be a monument to all time of the splendour of the family under whose roof it had been composed. When in 1575 it was brought to a close, he was anxious to submit his poem to the criticism of the principal literati of the day; and for this purpose he went in person to Rome. While there he listened with half consent to the offers of Scipio Gonzaga and Ferdinand de Medici, who were anxious to remove him from the service of Alfonso. But the attractions of Ferrara were again too strong. He returned to the city in 1576, but it soon appeared that he no longer enjoyed the full confidence of his patron. Matters rapidly grew worse; misfortune succeeded misfortune; malicious enemies were evidently at work against him; and their machinations were so underhand that he could find no method of defence. In 1577, partly from fear and partly in anger, he fled from Ferrara, and for a short time he found a sweet asylum with his sister at Sorrento. But it began to be noised abroad that T. was insane, and his proud and sensitive spirit chafed at the insult, and after wandering from city to city seeking rest and finding none, he again made his way to the fatal court of Ferrara. Neglected and insulted on his arrival he broke out into bitter reproaches against the duke; and the duke was, doubtless, only too glad to find him affording such a pretext for his own undoing. In March 1579, by the duke's orders, the high-souled and gentle-hearted poet was imprisoned as a madman in the lunatic asylum of Sta Anna. Of his manifold miseries, his mental agonies and bodily pains, his hallucinations, his hopes, his despairings, his consolations, his pleadings, his protestings, we have ample record in the letters and poems which, even in such circumstances, flowed from his pen; and from time to time some famous visitor to Ferrara—a Montaigne or an Aldus—tells us how he found him. At length in July 1586 Alfonso reluctantly yielded to urgent demands for his release, and the poet was allowed, but under surveillance, to go to Mantua. The Academy of the *Addormentati* or Sleepers offered him the chair of ethics and poetry at Genoa with a salary of 400 crowns, but his heart was set on Rome, and thither he departed in 1587. At first he finds 'the city beautiful and courteous,' but before long he writes that all his many hopes are ending in nothing. He next proceeded to Naples, expecting by a lawsuit to recover his mother's dowry, and there he was fortunate enough to find a true friend and admirer in the Marquis of Manso, who was destined at a later date to extend his hospitality to the youthful Milton. But Rome appeared now to have as fatal a fascination for him as Ferrara had formerly; and wherever he went—to Mantua, to Florence, to Naples—and however attractive his residence was made by his patrons and friends, it was always to Rome that he returned. Thither he was called in the autumn of 1594 by Cardinal Cinthio Aldobrandini; he was to be crowned with laurel in the capitol, even as Petrarch had been crowned, but the ceremony was deferred till spring. During the winter the poet's health gave way, and on 25th April 1595 he breathed his last in the monastery of St. Onofrio, on the Janiculum. A certain mystery still hangs over the relations of T. to the various members of the Este family. The investigations of Rosini render it probable that the poet had made advances to Leonora, which, whether acceptable or not to herself, were treated by the duke as a direct insult to his family. In none of his numerous letters does T. himself make more than covert allusion to the cause of the duke's displeasure, but at the same time he writes as if he were not ignorant of what it really was. Be it what it may, it cannot have been sufficient to justify Alfonso's conduct. As a poet T. takes rank with the greatest of his country. The *Gerusalemme Liberata* is artistically the most perfect epic of modern times; the *Aminta* is the very beau-ideal of a pastoral; the tragedy of *Torrismondo* was one of the best dramatic works in Italian before the appearance of Alfieri; and if all these were lost, some of his lyrical poems would preserve his fame. And besides, he takes no mean position as a master of Italian prose, more especially in the form of dialogue. Familiar with all the literary culture of his time, T. brought to bear on his great work not only the instinctive discernment of the poet but the reasoned decision of the scholar; and for nearly every incident in the complex structure of his principal poem he was perhaps only too ready to furnish a critical why and wherefore. His influence at once made itself powerfully felt in the general current of European literature; and the greatest poets of the succeeding generation were largely affected by his example and precept. The first Englishman who essayed to make his countrymen acquainted with T.'s epic was Richard Carew, but he was prevented from the completion of his task by the appearance of Fairfax's *Godfrey of Bulloigne, or the Recoverie of Jerusalem* (1600), which still has no small claim to be considered the best translation, though others have appeared by Henry Brooke (Lond. 1738), Thomas Hooke (Lond. 1738), John Hoole (Lond. 1762), Hunt (1818), Wiffen (1824-25), Broadhead (1837), C. Lesingham Smith (1851), A. C. Robertson (Edinb. 1853), Bent (Lond. 1856), and Sir J. K. James (2 vols. 1865). Next to the *Gerusalemme* in its popularity stands the *Aminta*, of which there are English translations by Fraunce (1591), John Reynolds (?) (1628), Dancer (1660), Oldmixon (1698), Dubois (1726), Stockdale (1770), and Leigh Hunt (1820). Collected editions of T.'s works have been published at Florence (1724, 6 vols.), at Venice (1722-42, 12 vols.), and at Pisa (33 vols. 1821-32), the last, which is edited by Rosini, being the best and most complete. Among the numerous works which have appeared on T. and his misfortunes, it will be sufficient to mention the following:—Manso, *Compendio della Vita di T. T.* (Naples 1619); J. A. de Charnes, *Vie du T.* (Par. 1690); Serassi, *Vita, &c.* (Rome 1785); G. Compagnoni, *Veglie di T.* (Milan 1810); Stefano Giacomazzi, *Dialoghi sopra gli Amori, &c., di T. T.* (Brescia 1827); Rosini, *Saggio sugli Amori di T. T., &c.* (Pisa 1832); Capponi, *Sulla Causa finora ignota della Aventura di T.* (2 vols. Florence 1840-45); R. H. Wilde, *History of the Madness and Imprisonment of T.* (New York 1841); P. Vimercati Sozzi, *Illustrazioni su Varii Argomenti Relativi a T. T.* (Bergamo 1844); R. Milman, *Life of T. T.* (Lond. 1850); J. H. Wiffen, 'Life of the Author,' in his ed. of the *Jerusalem Delivered*, with a postscript on the Rosini controversy (5th ed. 1854); Cibrario Degli, *Amori e della Prigione di T.* (Turin 1861); G. Voigt, *T. T. am Hofe von Ferrara*, in Sybil's *Historische Zeitschrift*, vol. xx. (Mun. 1868); Cardona, *Studi novi sopra del T. Alienato* (in *Nuova Antologia*, 1873); Cecchi, *T. T. e la Vita Italiana nel Secola XVI.* (Flor. 1877). A really critical life of T. is still a desideratum in English literature.

Tasso'ni, Alessandro, an Italian poet, born at Modena in 1565, studied law at Bologna and Ferrara, became secretary of Cardinal Colonna in 1597, and accompanied him to Spain in 1600. In 1612 he entered the service of Carlo Emanuele of Savoy, for

whom he had a high regard, but he was soon forced by the intrigues of his political enemies to give up his position. In 1626 he obtained the office of secretary to Cardinal Lodovisio, and after the Cardinal's death he was appointed in 1632 chamberlain to Francis I. of Modena. By his hostile *Considerazioni sopra le Rime del Petrarca* (Modena 1609) he acquired the name of *Petrarchomastix*; in his *Pensieri Diversi* (Rome 1612) he made a similar attack on Homer and Aristotle, and maintained that in everything—in literature as well as in science—the moderns had the pre-eminence; and in the *Secchia Rapita* (Paris 1622), a mock-heroic poem ostensibly describing the contest that arose from the rape of a Bolognese bucket by the people of Modena, he treats everything ancient as old-fashioned, and indulges in hilarious but cynical mockery of the general round of human life. His patriotism was severely wounded by the encroachments of the Spanish power, and in his *Filippiche* (Lat. ed. 1878), and his *Manifesto* (Flor. 1855), he laments the decay of Italian independence. T. died at Modena in 1635. The *Secchia Rapita* is his most popular work; it is regularly reprinted from time to time. The last edition was in 1878. A collection of his letters by Gamba appeared at Venice (1827).

Taste, Sense of, is not absolutely confined to the *Tongue* (q. v.) as commonly supposed, but is also exercised by the soft palate, the Tonsils (q. v.), and also the upper part of the pharynx. Like the other senses, it is a modification of the sense of touch. Substances to be tasted are, in other words, brought into direct contact with the sensory surface. For the due exercise of the S. of T. it is necessary that the substances to be tasted be in a state of solution. The saliva and fluids of the mouth thus serve the purpose of dissolving substances, and of bringing their particles into direct contact with the nerves of taste. Insoluble substances are thus usually tasteless, and their contact with the tongue and other parts of the mouth merely gives rise to a sensation of touch. A dry furred tongue, as is well known, is incapable of exercising the S. of T. Abnormal stimulation of the nerves of taste may give rise to altered sensations, as is the case indeed with other nerves of special sense under like conditions. If a current of air be directed upon the tongue, a cool saline taste is produced, analogous to that of saltpetre. A smart tap on the tongue gives rise to a sensation resembling that produced by electricity. The *nerves* of the tongue, palate, and other parts of the mouth which exercise the S. of T., consist of the gastatory branch of the fifth cranial nerve, and of the lingual branch of the *glossopharyngeal nerve*. These nerves also exercise common sensation or touch, whilst a third set supplied to the tongue (namely, the *hypoglossal nerves*) pass to the *muscular substance* of the organ, and endow it with motor power. The S. of T. appears to reside chiefly in the edges and tip of the tongue. The middle of the dorsum, or upper surface of the organ, is but feebly sensitive to taste. The sides and tip are also the seat of acute touch or common sensation.

There can be no doubt that the sense of taste is aided and supplemented by that of smell. In wine-tasting, much of the taste is lost if the nostrils be closed. The delicacy of the S. of T. varies greatly in different persons. A familiar way of stating the general delicacy of this sense is to say that by its aid 1 part of sulphuric acid in 1000 of water can be perceived; the sense of smell, however, being much more delicate still. The exercise of the S. of T. becomes impaired through repetition of a similar or allied taste, as is well seen in the confused sensations resulting from the tasting of two or more kinds of wines. *Subjective sensations* of taste, or those produced by internal causes, are common; most persons having the power to imagine a particular sensation of taste with tolerable vividness.

Tate, Nahum, born in Dublin in 1652, was the son of Dr. Faithful Tate, author of the *Scripture Map of the Wilderness of Sin* (Lond. 1655). Educated at Trinity College, Dublin, he went to London and adopted the profession of literature; and in 1690 succeeded Shadwell as poet-laureate. He died at Southwark, 12th August 1715. T.'s works comprise ten plays, a large number of occasional poems, and a prose collection of *Memorials for the Learned* (Lond. 1686); but he would be almost completely forgotten if he had not written a considerable portion of the second part of *Absalom and Achitophel*, and in conjunction with Dr. Nicholas Brady perpetrated the metre version of the Psalms which appeared in 1696, and ultimately took the place of the version by Sternhold and Hopkins.

Ta'tian, born in Assyria, of a pagan family, in the first half of the 2d c., was an ardent student of the philosophy of his time. Having fallen in with a copy of the Hebrew Scriptures, he was much affected by its contents, and proceeding to Rome, where he met Justin Martyr (q. v.), he made a profession of Christianity, wrote an Apology for it, and was a diligent expounder both of the Old and New Testament. After a time, however, he embraced certain heretical opinions, chiefly three:—(1) He reprobated marriage as on a level with fornication; (2) he held the existence of another God besides the God of all; and (3) he refused to believe that Adam was saved. By later writers he has been erroneously classed with Marcion (q. v.) and Valentinus (q. v.), and regarded as the founder of a school—the Encratites, &c. T. left a large number of writings, of which the most important, and the only one now remaining, is the Apology or Oration to the Greeks. His work, *The Composition of the Four* (Gr. *To dia tessarōn*), is notable as the first attempt to compile a harmony of the four gospels. See Donaldson's *Christian Liter. and Doct.* (vol. iii. Lond. 1866).

Ta'tius, Achill'es. See Achilles Tatius.

Ta'tius, Tit'us, a mythical king of the Sabines contemporary with Romulus. In vengeance for the rape of the Sabine women he advanced against Romulus, who retired to the Palatine Hill. T. posted himself on the Capitoline and Quirinal, and the two kings reigned in friendship over their respective peoples till the death of T., when Romulus was chosen sole king. T. gave name to the Titienses, one of the legendary 'three tribes' into which the Roman people were divided. See Rome.

Tatt'a, a town in the district of Kurrachi, Scinde, British India, 4 miles W. of the Indus, and 60 miles E. of Kurrachi, was formerly a place of great historical importance, but has been devastated by war and malaria. It still has a special manufacture of *lungis*, or scarfs of mixed cotton and silk. The imports are estimated at £40,000; the exports at £4000. T. contains a ruined fort and a handsome mosque, the Jumma Musjid, said to have been built by Shah Jehan. Pop. (1872) 7951.

Tatt'ies (from a Sanskrit word *tat*, 'canvas'), the screen of matted grasswork which is placed before the open doors and windows in most parts of India during the season of the hot winds, and constantly wetted with water to cool the air by evaporation.

Tattoo', a military signal to draw stragglers within the camp. It is given by the drum and bugle.

Tattoo'ing, a mode of personal ornamentation practised by savage peoples, and consisting in cutting or puncturing the skin with various patterns, into which a colouring matter is introduced. The custom appears to have been almost universal, though now disappearing before the spread of civilisation. The prohibition to the Jews (Lev. xix. 28) under the Mosaic law to 'print any marks' upon them, is believed to have reference to T., which is still practised in Arabia. The chief purposes of T., besides that of personal adornment, were to distinguish the rank of the person operated upon, and to mark his entrance on the privileges of manhood. Among the Fijians and Esquimaux a neglect of T. was also believed to prejudice their happiness in the future state. The rudest form of T. is that practised by the Australian blacks and some tribes of Kaffirs. It consists in cutting gashes, arranged in patterns, on the skin, and filling the wounds with clay, so as to form raised scars. In Polynesia the art reached its highest point of perfection. In the Marquesas group, for example, the men were tattooed all over, even to the fingers and toes, and crown of the head, and as each operation lasted from three to six months, a man could scarcely be decorated with an elaborate tattoo before he was thirty years old. In New Zealand the face was the part most tattooed, and tattooed Maori heads were at one time in request for European museums, but they are no longer obtainable in the colony. The T. instruments used in Polynesia consisted of pieces of sharpened bone fastened into a handle, and with their edges cut into teeth. These were dipped into a solution of charcoal, and then struck into the skin with a mallet. The pain produced being intense, female relatives of the patient were commonly employed to drown his cries with their songs. In this country T. was practised by the ancient Britons, and the custom still common among sailors

of printing various devices on their arms, is regarded as a survival of the practice.

Tau, Cross of, or **St. Anthony's Cross**, a heraldic decoration in the form of the letter T, with broadened extremities.

Tauch'nitz, Karl Christoph Traugott, a famous German printer and bookseller, was born at Grosspardau, near Grimma, 29th October 1761; learned the printing trade at Leipzig, where, after serving for some time with Ungar of Berlin, he began business in 1796. He added to printing works a book-store in 1798, a type-foundry in 1800, and the first German stereotype-foundry in 1816. From his establishment, which soon became one of the largest in Europe, issued numerous works equally remarkable for their accuracy, fine typography, and cheapness, and among these perhaps the most notable were editions of Greek and Roman classics, dictionaries, and Bibles. A characteristic specimen of T.'s art is his edition of the Koran of 1834. He died at Leipzig, 14th January 1836.—**Christian Bernhard, Freiherr von T.**, a nephew of the preceding, was born at Schleinitz, near Naumburg, 25th August 1816, and founded the publishing firm of Bernhard T. in Leipzig, which has become universally known through its *Collection of British Authors*, a series comprising 1711 volumes, from 1841 to 1878. The firm is also famed for the publication of many important works in jurisprudence, philology, and classical literature. A series of *German Authors* have issued periodically from its press since 1866. The Duke of Koburg created T. a baron in 1860, and at present (1878) he acts as the British consul-general at Leipzig.

Tau'ler, Johannes, a German mystic and preacher of the 14th c., was born at Strassburg about 1290. In 1308 he joined the Dominicans, and thereafter studied theology for two years at Paris. He soon rose to eminence as a preacher, but in consequence of interviews with a remarkable layman, Nikolaus of Basel, he became so much dissatisfied with himself that he withdrew from the pulpit for two years. On his reappearance he spoke with a power and force that drew crowds to hear him, and at the same time with a recklessness that spared neither powers temporal nor powers spiritual. Accordingly his bishop interdicted him from preaching, and drove him from Strassburg. He went for some time to Köln, but finally returned to end his days in his native town. He died 16th June 1361. His works consist of *Predigten* (new ed. Prag, 1872), and *Nachfolgung des armen Lebens Christi* (Frankf. 1833; ed. by Denifle, Munich 1877). In these works no dogmatic system is regularly expounded, but the chief doctrines of theology are touched upon and expounded in a peculiar mystical manner; but T. united an earnest living faith with these speculations. The deep impressiveness of intense conviction was about everything he said or wrote. He united this with a breadth of view rare in his age and profession, and which well entitled him to the name of 'Doctor Illuminatus,' by which he is distinguished in ecclesiastical biography. See Miss Winkworth, *Life and Times of T.* (Lond. 1857); and K. Schmidt, *Nikolaus von Basel, Bericht von der Bekehrung Taulers* (Strassb. 1875).

Taun'ton ('the town on the Tone'), a town of Somersetshire, on the Tone, 10 miles S.S.E. of Bridgewater by rail, is an important railway centre. Its churches include St. Mary Magdalene, with a noble Perpendicular tower 153 feet high (rebuilt 1858-62), St. James's, with a tower of 116 feet (rebuilt 1875), and St. John's (1863), Second Pointed style, with a spire of 130 feet. Other buildings are a Second Pointed Roman Catholic church (1860), and a Franciscan convent; the Elizabethan Shire Hall (1859), old and new market houses; a masonic hall (1879); the Somerset Hospital (1809); barracks (enlarged 1877, at a cost of £30,000), &c. Besides a free grammar-school (founded 1522; incorporated in 1869 with the Church of England College), there are large Wesleyan (1847) and Independent (1868) colleges. The dismantled Norman castle, in whose great hall Judge Jeffreys held the 'Bloody Assize,' contains now a literary institute and archæological and natural history museum; and there are further monastic remains and a Roman bridge. Formerly one of the great Somerset 'clothier-towns,' T. is now mainly agricultural, yet it has some collar-making, silk-spinning, tanning, paper-making, and iron-working industries. It publishes four newspapers, and returns two members to Parliament. Pop. (1871) 15,466. A wooden fort, founded by Ini of Wessex (688-726), on the banks of the Tone, was the germ of this ancient town, which under the Conqueror was the seat of a mint, in 1497 was seized by Perkin Warbeck, was successfully defended by Blake against 10,000 Royalists (1645), and gave Monmouth a brilliant ovation (1685).

Taun'ton, a town of Massachusetts, U.S., 36 miles S. of Boston by rail. It has 19 churches, 5 banks, a public library, 1 daily and 2 weekly newspapers. The T. river supplies motive power for various industries, which include cotton, machinery, nail, tool, and oil-cloth manufactories, brickworks, engine-works, &c. There is an annual exhibition of mechanical and agricultural implements by the Bristol Agricultural Society. Valuation of town $18,000,000; pop. (1870) 18,629. T. was founded by a colony from T. in England, in 1638, was incorporated as a town in 1639, and as a city in 1864.

Tau'rida, a government in the S.E. of Russia, which includes the peninsula of the Crimea (q. v.), is bounded on the E., S., and S.E. by the Sea of Azov and the Black Sea. Area, 24,537 sq. miles; pop. (1870) 658,549. The greater part of it belongs to the Nogai Steppe, only $\frac{1}{10}$ths being under cultivation, and at least a half unenclosed pasture-land. From the steppe there is a gradual rise through the Isthmus of Perekop to the Crimea, some of whose ranges attain an elevation of 5000 feet. The only river of importance is the Dnieper, which forms the N. W. boundary. Salt lakes abound on the treeless steppes. Vines and orchard-trees are cultivated to a certain extent, but cattle-breeding is the main employment of the inhabitants. The population is very mixed, about one-third of the whole being Little Russians, 100,000 Nogai Tartars, 50,000 German colonists, 22,000 Bulgarians, 15,000 Jews, 14,000 Greeks, and 11,000 Armenians. The chief towns are Simferopol the capital, Sebastopol, Feodosia, and Kertch.

Tau'rine ($C_2H_7NSO_3$), a beautifully crystallisable substance, prepared by boiling dilute hydrochloric acid with taurocholic acid, one of the constituents of Bile (q. v.). It may also be prepared by heating isethionate of ammonia (NH_3, H_2O, C_2H_4, SO_3), which loses its water. This salt not only has a composition apparently made up of the union of ammonia, water, olefiant gas, and sulphuric anhydride, but by a very simple series of operations can be formed by direct synthesis from these.

Tau'rus (Gr. *Tauros*, from N. Semitic *Tûr*, 'a mountain'), the S. border-range of the plateau of Asia Minor, stretching from the Euphrates W. to the Ægean Sea, and forming an unbroken chain, which presents to the S. steep, rocky sides. It rises in terraces to a height of 10,000 feet, and together with the Anti-T. encloses an elevated arid plain, dotted with salt lakes. Across the Kilia Pass and Gülek-Boghas is carried the caravan traffic between Asia Minor and Syria. The rivers Seihun and Dschihan (*Pyramus*) separate the range in the E. from the Akma Dagh (anc. *Amanus*), which forms a connecting-link with the Lebanons of Syria. The Anti-T., continuing in a N.-easterly direction from the main range, joins the system of the Caucasus.

Tautol'ogy (Gr. *tautologia*, from *tauto*, *i.e.*, *to auto*, 'the same,' and *legō*, 'I say') is the unnecessary repetition of the same thought in different words, as in such a sentence as 'The two regiments *simultaneously* attacked the citadel *at the same time*.' If repetition of the thought is needful for greater lucidity or emphasis, it cannot be condemned as tautological; and there are certain phrases such as 'to let and hinder,' in which the T., originating in the epexegetic addition of the second word, is completely sanctioned by usage. Owing to the number of words whose composition and content are only to be distinctly discovered in the foreign language from which they are borrowed, English lends itself to the vice of T. more readily perhaps than most other tongues.

Tautog, a Teleostean fish, the *Tautoga nigra* of naturalists, also named 'Blackfish,' common in N. American seas, and valued for the delicacy of its flesh. Its average weight is from 10 to 14 lbs.; its colour is black, with a whitish belly and sides, and the teeth are numerous and strong. The T. is allied to the Wrasses (q. v.) or *Labridæ*.

Taver'nier, Jean Baptiste, a French traveller, the son of a Flemish engraver, was born at Paris in 1605, and while quite a youth travelled, on the spur of curiosity, through the Netherlands, England, Germany, Hungary, and Italy. He accompanied two French noblemen in a lengthened tour in the East—from Constantinople, through Erzeroum, Tabriz, Ispahan, Bagdad, and Aleppo to Rome—in 1630-33, and from 1638 to 1669 he made five other eastern journeys, crossing Syria and the

Arabian Desert, and proceeding as far as Persia, Hindustan, and Batavia. In these latter journeys he adopted the disguise of dealer in precious stones, and by trading in jewellery amassed a considerable fortune. For promoting French trade in India he was created Baron d'Aubonne by Louis XIV. in 1669. He subsequently squandered his fortune, but settling at Berlin after the Revocation of the Edict of Nantes, was appointed director of an East India company which the Elector of Brandenburg was then founding. While setting out in search of a Russian road to India, he died at Moscow, July 1689. Voltaire said of T. that he *parle plus en marchand qu'en philosophe.* Though an acute, intelligent observer, he was destitute of literary skill, but a report of his six journeys was edited by Chappuzeau and La Chapelle (3 vols. Par. 1676-79; Eng. trans. 1678-84; Dutch, 1682; Ger. 1684; new ed. 7 vols. Par. 1810).

Tavi'ra, a seaport in the S. of Portugal, province of Algarve, on both banks of the Rio Sequa, about equi-distant (20 miles) from Faro on the W. and the Guadina on the E. It has a Moorish castle, two collegiate churches, a richly-endowed hospital, and good sardine and tunny fisheries. Pop. 9000.

Tav'istock, a market-town of Devonshire, 16½ miles N. of Plymouth by rail, lies in a hollow on the right bank of the Tavy, with Dartmoor stretching away from it to the E. The parish church, with a lofty tower standing on piers, was restored (1845), and a new church, Romanesque in style, erected at Fitzford (1867); but of the once famous Benedictine Abbey (founded 961) little remains but a gate-house, a porch, and the refectory, which now are severally used as a public library, dairy, and Unitarian chapel. Other buildings are a Congregational church (1873), with a spire 140 feet high; the guildhall (1848), fronting which is a bronze statue (1864), by Stephens, of the seventh Duke of Bedford, the corn market (1839), and covered markets (1863). These last three structures are all in Late Perpendicular, as also is the Kelly College (1875-76), founded for the sons of deceased naval officers by the late Admiral Kelly with a bequest of £80,000. T. chiefly depends on the neighbouring tin and copper mines, the latter including the Devon Great Consols, which yield almost all the arsenic produced in England, and had paid up to April 1877 £1,195,520 in dividends. In the town itself are engine and machine works, iron foundries, maltings, &c. T. publishes one weekly newspaper, and returns one member to Parliament. Pop. (1871) 7725. The abbey, in which was set up the second English printing press, passed at the Dissolution to the Russells; and its later fame T. owes to its having been the birthplace of Drake (q. v.) and William Browne (q. v.), and the place that Pym represented in the Long Parliament.

Tavoy, the chief town of a district of the same name in British Burmah, 220 miles S. of Moulmein and E. of Bangkok, from which it is separated by a narrow mountain-chain. Pop. (1872) under 5000. It is a seaport, with an export of rice and timber, valued in 1874-75 at £46,517; imports, £54,406.—The *district* of T., a narrow strip along the Bay of Bengal, has an area of 7200 sq. miles; pop. (1872) 71,827.

Taxa'tion of Costs. See Costs.

Tax'es and Taxa'tion are respectively the imposts which the state exacts for its support from its inhabitants, and the manner in which these imposts are levied. In its theoretical aspects the subject forms an important part of the science of political economy, which under this head considers the general effects of taxation on the well-being of the community. The right to tax lies with the *de facto* government for the time being. Such a government performs indispensable functions, and the produce of taxes is required for such performance. The practical problem is how may taxes be best levied. Adam Smith has given the following rules on the subject: 1st, Taxation should be equal—'the subjects of every state ought to contribute to the support of the government as nearly as possible in proportion to their respective abilities.' 2d, The amount to be levied should be clearly and definitely known beforehand by the payers; and, 3d, it should be taken from him at the time and in the manner most convenient for him. 4th, The state should receive as much as possible of the actual amount paid by the taxed. The general truth of these canons is evident. But it is to be observed that absolute fairness of taxation is unattainable, because any one principle on which we might go would not only conflict with others equally good, but would show itself glaringly unjust in many particular cases. An approximate equality is all to which we can attain. Taxes may be general—levied from the community; or particular—from a class or individuals. They are further of two kinds—direct and indirect. The first is taken directly from the taxed, the second is connected with the use of certain articles. The *incidence* (or real payment) of a tax is different in the two cases. In the one the first payer, in the second the consumer of the article, is really the taxed person. Thus a land-tax is really paid by the proprietor of the land, but a tax on commodities, as for instance on bread, though paid to the government by the maker, would cause a rise sufficient to reimburse the payer, and such rise would of course be paid by the consumer. Each of these two systems has its advantages and disadvantages. Direct taxes are probably levied with less expense of collection. They impress upon the taxpayer the exact amount he is paying to government, and thus directly interest him in financial reform, and they are more easily adjusted so as not to press heavily on the poor. But, on the other hand, the payment of large sums of money at once to government creates a disagreeable irritation, and an after dangerous feeling, and the payment of direct taxes is easily evaded to a great extent by the dishonest (*e.g.*, the income-tax). Indirect taxes, on the other hand, are payable at a time and manner most convenient to the consumer. Then, luxuries which either give only a partial benefit (wine, spirits, tobacco), or those which are only luxuries because they are expensive (gold and silver-plate, diamonds, &c.), are peculiarly suited for indirect taxation. But they require an extensive machinery for collection. The excise regulations often interfere with the proper manufacture of commodities, and the custom-house is a barrier to rapid and easy transit from one country to another. They often press unduly on the poor, and though attempts have been made to obviate this by an *ad valorem* rate (*i.e.*, taxing different qualities of an article at different prices), such attempts have not been generally successful. Since, however, taxes are necessary evils, it would seem that a judicious combination of the two systems is best. J. S. Mill enumerates land, legacies, and houses as the best subjects for direct taxation; while indirect taxation should fall —1st, on luxuries; 2d, on necessary articles in an inverse ratio to their necessity; and 3d, on as few articles as possible, in order to lessen the trouble and expense of collection. But no indirect taxation should be so high as to present inducements to smuggling. As to the historical side of the question, T. arose in modern Europe from the decay of the feudal system. Before that the state had sufficient lands in its own possession to defray the expenses of government. But these were afterwards very generally gifted away, and the expenses consequent on the development of governmental functions soon made taxation a necessity. In England the question enters largely into our constitutional history. In early times the king, with the consent of the Witan, raised extraordinary taxes. Under the Norman kings, and on through the later monarchs, the principle 'that there must be no taxation without representation' grew in force, though it was probably the effects of the American War of Independence that raised it to a constitutional axiom. With the unavoidable exception of India, it now prevails through the English empire. Our taxes are divided into Customs, Property, Income, Excise, Assessed, and Stamp. The literature of taxation is peculiarly rich. The following treatises on the subject may be mentioned: Hume's *Essay on Taxation*; M'Culloch on *Taxation* (Lond. 1845); Stansfield, *Direct Outline of Taxation* (Lond. 1849); L. Levi's *Taxation, how Raised* (Lond. 1860); Morton Peto's *Taxation* (Lond. 1863); G. Holloway, *Taxation and Representation* (Lond. 1867); W. P. Urquhart, *Dialogues on Taxation* (Lond. 1867); G. Goschen, *Local Taxation* (Lond. 1873); and R. D. Baxter, *Taxation and Local Government* (Lond. 1874). For the historical aspects of Taxation, see Stephen Dowell's *Sketches of the History of Taxation in England* (vol. i. 1876); and Stubbs's *Constitutional History* (3 vols. Oxf. 1874-78).

Taxicorn'es, a group of *Coleoptera* or beetles, of the *Heteromerous* section of the order. The legs are short and the body somewhat square. The antennæ are also short. The T. are commonly found under the bark of trees.

Tax'idermy (Gr. *taxis*, 'arrangement,' and *derma*, 'a skin') is the art of preparing and preserving the skins of animals, and in a general sense includes the mounting of them for museum purposes. The skin is carefully removed from the animal, the skull and the bones of the limbs only being preserved; it is then

anointed with arsenical soap, of which several kinds are used. The soap cut in thin slices is dissolved with a little water at a gentle heat, salt of tartar and powdered chalk are then added; it is then taken from the fire, the arsenic put in and stirred gently; camphor, with the addition of a little spirits of wine, is pounded in a mortar and the whole mixed together. For the skins of larger animals powdered burnt alum is frequently used. Familiarity with the appearance and form of the animal to be stuffed is essential, and the best and most natural-looking work is produced by preparing an accurate model of the creature, over which the skin is drawn and fastened. The lower animals and the fishes and reptiles, unless when large, are usually preserved in spirits of wine.

Tay, the greatest of Scottish rivers, drains nearly all Perthshire, having a length of 126 miles, and a drainage area of 2500 sq. miles. Its headwater, the Dochart, rises in Ben Lui, to the N. of Loch Lomond, and is joined by the Lochy just before entering Loch T., which is 16 miles long and 2 broad, with an extreme depth of 600 feet. Lying 355 feet above the sea-level, the picturesque lake stretches in a N.-easterly direction along the base of Ben Lawers. After leaving the loch, the river takes a northerly bend, and from the E. and N. receives the Lyon, Tummel, Garry, Bruar, and Isla, and from the W. the Almond, Earn, &c. It passes Dunkeld and Perth, and below the latter place widens into a noble estuary, which attains a breadth of 3 miles, and on the N. side of which is situated Dundee. The navigation of the T. even to Dundee is difficult, owing to the shifting sandbanks, the positions of which are clearly shown in a new chart of the estuary prepared in 1876. The T. has a current of about 5 knots an hour, and is tidal to about 2 miles above Perth, which can be reached by vessels of 100 tons. The salmon-fishing is important, and at Stormontfield, 5 miles above Perth, there are extensive salmon-ponds. The T. fleet of whaling and sealing vessels, with headquarters at Dundee, brought home cargoes to the value of £144,900 in 1877, and £65,800 in 1878.

T. Bridge.—A few miles to the W. of Dundee, the T., at this point about 2 miles wide, is crossed by the great bridge of the North British Railway, the longest structure of its kind in the world. It consists of 85 spans, proceeding from the S. side—13 of 67 feet, 2 of 88, 10 of 130, 13 of 145, 13 of 245, 1 of 162, 11 of 130, 25 of 69, 1 of 170, and 6 of 27. The 13 spans of 245 feet are placed high enough to leave a clear waterway of 88 feet at high water. The superstructure of parallel lattice-girders rests on large malleable-iron caissons and cylinders sunk to a required depth, and partly filled with brickwork, partly with concrete. The six caissons of the central spans are sunk only a few feet into the bottom and then piled, the piles being 60 feet long. The piers were sunk through the clay overlying the bottom rock by the pneumatic process, and the spans raised to position by powerful hydraulic apparatus. The work, designed by Mr. Bouch, and executed by Hopkins, Gilkes, & Co., of Middlesborough, is remarkable not more on account of its size than of the originality of its conception, its great stability, and its comparatively small cost (£509,000). It was begun in June 1871, but operations were little more than experimental till August 1875, from which date rapid progress was made, the last pier being floated out 26th December 1876. In February 1878 it was tested by General Hutchinson, Government Inspector of Railways, who ran five engines of 72 tons each across it, thus bringing to bear 360 tons on each of the 245 feet spans, a pressure far exceeding any that may be reached in ordinary traffic, for which the bridge was opened, June 1, 1878.


Tay Bridge (from Dundee side).

Taylor, Bayard, an American traveller and litterateur, born at Kennett Square, Pennsylvania, 11th January 1825, was apprenticed to a printer in 1842, and made a tour in Europe (1844-45). On his return he published *Views Afoot*, &c. (1846), and in the following year was placed on the editorial staff of the New York *Tribune*, in which most of his subsequent works of travel appeared originally. These works, racy in form and full of keen observation, sufficiently indicate the range of his travels. They comprise a *Journey to Central Africa* (1854), *Visit to India, China, and Japan* (1855), *Pictures of Sweden, Denmark, and Lapland* (1857), *Travels in Greece and Russia* (1859), *At Home and Abroad* (1859; 2d series 1862), *Colorado* (1867), *Central Asia* (1874), and *Egypt and Iceland* (1874). Besides four novels, T. wrote several volumes of spirited musical verse, the last being *Prince Deucalion* (1878), a kind of mystical drama. He made a masterly translation of both parts of Goethe's *Faust*, in the original metres (2 vols. 1870-71), and was engaged from 1872 on biographies of Goethe and Schiller. T. edited a *Handbook of Literature and the Fine Arts* (1852), a *Cyclopedia of Modern Travel* (1856), Frithiof's *Saga*, from the Swedish of Tegner, by Blackley (1867), and the *Illustrated Library of Travel, Exploration, and Adventure* (1872 *et seq.*). He also contributed notes on Loo-Choo and Japan to the *Narrative of Parry's Expedition*, and an introduction to Stoddart's *Life of Humboldt*. His wife, Maria, daughter of Hansen, the astronomer of Gotha, has translated most of his works into German, in which language they find many admirers. In 1862-63 T. was United States secretary of legation and for a while charge-d'affaires at St. Petersburg, and in February 1878 was appointed Ambassador at Berlin, a post he held with honour till his death, on the 19th of December following. A collected edition of his travels appeared in 10 vols. (New York 1869), and his complete poetical works in 1873.

Taylor, Brook, LL.D., F.R.S., an English mathematician, was born at Edmonton, near London, August 18, 1685. He entered St. John's College, Cambridge, in 1701, where he took his bachelor's degree. In 1714 he became secretary to the Royal Society, and in the *Philosophical Transactions* are published his papers on the centre of oscillation and other mathematical subjects. His *Methodus Incrementorum* (1715) contains the famous theorem which goes by his name, and which Lagrange adopted in 1772 as the basis of his calculus of functions. He wrote also the *New Principles of Linear Perspective* (1719), and *Contemplatio Philosophica*, which was left in MS. and published, with a life of T., by his grandson, Sir W. Young, in 1793. T. died in London, December 29, 1731.

Taylor, Sir Henry, an English dramatic author, was born in 1800. He is the only son of George Taylor of Witton Hall, Durham, author of the Memoir of Robert Surtees, prefixed to vol. iv. of the *History of Durham*, and published separately in 1852. Having entered the colonial office in 1823, he rose to be one of the five senior clerks, but retired from service in 1873. In 1862 he received the degree of D.C.L. from Oxford, and in 1869 he was raised to the rank of Knight Commander of the Order of St. Michael and St. George. T.'s most important contributions to literature are his plays, *Isaac Comnenus* (1827), *Philip van Artevelde: a Dramatic Romance* (1834), *Edwin the Fair: an Historical Drama* (1842), and *The Virgin Widow* (1850)—which, though not designed for the stage, are admirable in point of workmanship, and charm the reader at once by the careful discrimination of the characters and the polished

precision and controlled energy of the language. Not a few of the pithy lines have become familiar quotations. T.'s other works are *The Statesman* (1836), *The Eve of the Conquest, and Other Poems* (1847), *Notes from Life, in Six Essays* (1847), *Notes from Books, in Four Essays* (1849). A collected edition of the plays and poems appeared in 1863 (3 vols.); and the first volume of an edition of his whole works in 1877.

Taylor, Isaac, 'of Ongar,' born in London in 1759, gained some repute as an engraver, and in 1786 settled at Lavenham, Suffolk. He became the minister of an Independent congregation at Colchester (1796), and at Ongar (1810), where he died, December 11, 1829. He wrote many books for children, as also did his daughters Jane (died 1824), and Ann, Mrs. Gilbert (died 1866), joint authors of *Original Poems*. See the *Memoirs of Ann T.* (1825), edited by her brother; and the *Autobiography of Mrs. Gilbert* (1874).—His son, **Isaac T.**, a writer who may be best described as a Christian philosopher, was born at Lavenham, August 17, 1787. He was trained as an artist and mechanician, and several of his inventions in the latter capacity have been found of permanent value; but he soon abandoned art for literature, and during the long period of fifty years he laboured steadily at this vocation. In 1862 he received a pension of £100, which he enjoyed till his death at Stamford Rivers in Essex, June 28, 1865. T. was a voluminous writer—his chief works being: *Elements of Thought* (1823), *History of the Transmission of Ancient Books to Modern Times* (1827), *The Processes of Historical Proof Exemplified and Explained* (1828), *The Natural History of Enthusiasm* (1829), perhaps his best, certainly his most famous production, *Fanaticism* (1833), *Spiritual Despotism* (1835), *Physical Theory of Another Life* (1836), *Ancient Christianity* (1839-40), *Lyola and Jesuitism* (1849), *Logic of Theology* (1859), *Ultimate Civilisation* (1860), *Spirit of Hebrew Poetry* (1861). T. was an enlightened and acute, though not very original or profound, thinker. His works are written pleasantly and in the very best spirit, for he was quite free from that mixture of ignorance and fanaticism which is too often the characteristic of the school to which he belonged.—The **Rev. Isaac T.**, vicar of Holy Trinity, Twickenham, son of the preceding, was born 3d March 1829. He is author of *Words and Places* (1865), *The Family Pen, Memorials of the T. Family* (1867), and *Etruscan Researches* (1874).

Taylor, Jeremy, 'the modern Chrysostom,' was born at Cambridge, August 15, 1613. He studied as a sizar at Caius College, and took his degree of M.A. in 1633. Shortly after he was admitted to holy orders, and his fine appearance and vivid eloquence soon attracted admiration. He won Laud's favour, and through the influence of that prelate was made a fellow of All Souls' College, Oxford. In 1638 he was appointed rector of Uppingham in Rutlandshire. In the civil war, T., whose intellect was impregnably entrenched in reverence for ecclesiastical antiquity, naturally took the royal side, and so lost all his preferments. For many years he lived in retirement in Wales, busily engaged in writing books. In 1658 he went, on the invitation of the Earl of Conway, to Ireland. Immediately after the Restoration he was made Bishop of Down and Connor, which see, as also that of Dromore, he held till his death at Lisburne, 13th August 1667. T.'s writings may be classified as Practical, Theological, Casuistic, and Devotional. Under the first head we have a *Life of Christ* (1649), which deals with the main incidents of the gospel narrative, and steers clear of theological discussions, *Holy Living* (1650) *and Holy Dying* (1651), and *Sermons* (1651-53). To the second class belong his *Episcopacy Asserted* (1642), a temperate and reasoned defence of the principles of his church, with which may be classed his *Apology for Authorised and Set Forms of Liturgy*, *The Liberty of Prophesying* (1648), a plea for toleration and mutual charity among all Christian sects, *The Doctrine of Repentance, or Unum Necessarium* (1655), a work condemned by his brethren for its arguments as to the nature of sin, and *Dissuasion from Popery* (1647). His chief casuistic work is his *Ductor Dubitantium* (1660), an elaborate and somewhat wearisome discussion of very many points in Christian ethics, while his best devotional work is his *Golden Grove* (1655), so called after the mansion of his Welsh patron and friend, the Earl of Carberry. T.'s writings are distinguished in their best parts by a sweet, rich, and solemn eloquence, an artless grace of style, and a heavenly serenity of spirit. His wealth of illustration is absolutely without limit. Simile after simile springs from his teeming fancy until the primary thought is almost lost amid an Oriental splendour of imagery. Emerson calls him the 'Shakespeare of divines.' If we have regard only to the exuberance of his genius, the phrase is not hyperbolical. His learning was vast and curious, and it is frequently introduced in the happiest and quaintest manner to illustrate the subject under discussion. The study of scholastic philosophy has not been without its bad effects on him. Frigid conceits and far-fetched allusions occasionally mar his writings. Personally T. was a man of a truly Christian disposition and of such a noble charity that he stands out in gracious contrast to most of his contemporaries. His sentiments on toleration (like those of Milton) lift him immeasurably above his age and his party, and entitle him to be held in perpetual honour by all who think it a crime to punish freedom of thought. See T.'s complete works with life by Eden (10 vols. Lond. 1854). There is also a fine essay on T. in *Masters in English Theology* (1877).

Taylor, John, styled by himself 'The King's Majesty's Water-Poet,' was born in Gloucester about 1580. After serving in sixteen voyages, having been with Essex at Cadiz and the Azores, he began to ply as a waterman on the Thames, at the same time keeping a public-house, and soon became known as a humourist and a writer of doggerel verses which he hawked about for sale. He was chiefly distinguished by the performance of several fantastic feats of rowing, which are celebrated in his *Travels in Germanie; or Three Weeks, Three Daies, and Three Hours' Observations and Travel from London to Hamburg* (1617), and *The Praise of Hempseed, with the Voyage of Mr. Roger Bird and the Writer hereof, in a Boat of Brown Paper, from London to Quinborough in Kent* (1623). The most memorable incident in his life, however, was his travelling on foot from London to Edinburgh, 'not carrying any money to or fro, neither begging, borrowing, or asking meat, drink, or lodging.' He set out on the 14th July 1618, and reached Edinburgh on the 13th of August. This journey was believed by Ben Jonson to have been undertaken 'in malice or mockage' of him on account of his similar journey shortly before; yet, meeting him at Leith, Ben presented T. with 'a piece of gold of two-and-twenty shillings to drink his health in England.' T.'s journey is narrated in his *Penniless Pilgrimage, or the Moneyless Perambulation of J. T., alias the King's Majesty's Water-Poet, from London to Edenborough on Foot* (1618). In 1630 T. published *All the Works of J. T., being Sixty and Three in Number*, but before his death in 1654 he had produced 138 separate publications. A complete edition of his works is being published by the Spenser Society (Part I. 1867-68; Part V. 1877-78).

Taylor, John, D.D., born in Lancashire in 1694, was educated at Whitehaven, and obtained his degree from a Scotch university. He acted as pastor for many years to a Norwich Unitarian congregation, but in 1757 became tutor in the academy of Warrington, where he died, March 5, 1761. T. was author of *The Scripture Doctrine of Original Sin* (1738), *The Scripture Doctrine of the Atonement* (1750), a *Hebrew Concordance to the English Bible* (1754), *Scheme of Scripture Divinity* (1762), &c. These writings once excited considerable interest. The somewhat Socinian theology of Robert Burns's youth was confessedly influenced by them.

Taylor, Meadows, an Anglo-Indian author and administrator, was born at Liverpool 25th September 1808, and exchanged the drudgery of a merchant's office for a situation in a so-called mercantile house in Bombay, where he was rescued from becoming 'Baxter's shopboy' through the kindness of a relative, Mr. Newnham, then chief secretary to the local government, who procured him a commission in the Nizam's army. In Hyderabad he set himself to earnest study of the languages, and was for four years (1826-30) in charge of a large district of the Nizam's dominions. After a visit to England (1838-40) he was placed in charge of Shorapore, a small state tributary to the Nizam, and here, as in the district of Nuldroog, to which he was transferred in 1850, he laboured with a zeal, wisdom, and benevolence which made him 'a ministering angel to a population whose last refuge from unbearable tyranny was a migration into British territory.' In the crisis of the Mutiny he was sent to preserve order in Berar, and in 1860 was driven home by failing health. He had risen to the

rank of colonel, and was selected by the Queen herself for a Companionship of the Star of India. After a brief visit in 1875 to the scene of his early labours, he died at Mentone, May 13, 1876. The high opinions entertained by competent judges of his character and capacity have given rise to a regret that freer scope should not have been found for his administrative talents. His literary works comprise the terribly realistic *Confessions of a Thug* (1839, new ed. 1858); *Tippoo Sultaun, a Tale of the Mysore War* (1840); *Cromlechs, Cairns, and other Scytho-Druidical Remains in Sorapur* (1853); *Tara, a Mahratta Tale* (1863); *Ralph Darnell* (1865); a *Manual of the History of India, from the Earliest Period to the Present* (1870); *Seeta* (1873); and *A Noble Queen, a Romance of Indian History* (3 vols. 1878). T.'s novels will always rank high in the literature of scenery and manners. See his manly, interesting *Story of My Life*, edited by his daughter (2 vols. Edinb. 1877).

Tay'lor, Tom, journalist and dramatist, was born at Sunderland in 1817. He was educated at Glasgow University, and at Trinity College, Cambridge, where he gained a Fellowship, and took the third place in the Classical Tripos of 1840. In 1845 he was called to the bar at the Inner Temple, and began to go the Northern Circuit, but soon relinquished the legal profession, and became a leader-writer for the *Morning Chronicle* and *Daily News*, at the same time doing much work as a dramatist. T. was one of the earliest contributors to *Punch*, of which, since the death of Shirley Brooks in 1874, he has been editor. In 1854 he was appointed Secretary of the Board of Health, but has recently retired from this position. T. has written over 100 dramatic pieces, nine-tenths of which, he himself tells us, are perfectly original. Among the most noted of his dramas are *To Parents and Guardians*, *New Men and Old Acres*, *Masks and Faces* (written in collaboration with Mr. Charles Reade), *Two Loves and a Life*, *The King's Rival*, *To Oblige Benson*, *The Blighted Being*, *Still Waters Run Deep*, *Our American Cousin*, *The Overland Route*, *An Unequal Match*, and *The Ticket-of-Leave Man*. His volume of *Historic Dramas* (Lond. 1877) includes *The Fool's Revenge*, *Jeanne D'Arc*, *'Twixt Axe and Crown*, *Lady Clancarty*, *Arkwright's Wife*, *Anne Boleyn*, and *Plot and Passion*. He is also distinguished as an art critic, and has edited *The Autobiography of B. R. Haydon* (Lond. 1852), and *The Life and Times of Sir Joshua Reynolds* (Lond. 1865). See *Dramatists of the Present Day*, by 'Q' (Lond. 1871), and *The Dublin University Magazine* for August 1877.

Tay'lor, Thomas, 'the Platonist,' was born in London, 15th May 1758, and destined for the Dissenting ministry, received three years' schooling at St. Paul's. Poverty forced him to accept a clerkship in Lubbock's Bank, but all his leisure he gave up to study, and published in 1787 the *Hymns of Orpheus*, first of a series of classical, and mainly philosophical, translations. Besides occasional papers, he issued in the years 1780-1834 no fewer than 37 different works, in 63 volumes (one-third of them large quartos). Some, published by patrons, belong by their history to the curiosities or amenities of literature; others, for which he was paid by booksellers, to its calamities. Thus his *Pausanias* (3 vols. 1794) brought him but £18; *Plato* (5 vols. 1804) lay for forty-four years entombed at Arundel Castle; whilst *Aristotle* (9 vols. 1812), whose edition was limited to fifty copies, gained him a pension of £100 from Mr. Meredith, a retired tradesman. This T. enjoyed down to his death at Walworth, his residence for forty years, 1st November 1835.

Taylor, William, 'of Norwich,' born in that city in 1765, was educated at Palgrave by Mrs. Barbauld's husband, and in 1779 entered his father's counting-house. Two visits to the Continent made him familiar with French, Italian, and German, and commerce he soon exchanged for an assiduous study of the last-named literature, which he had the honour of introducing to his countrymen. Translating, at first an amusement, was rendered a necessity by mercantile losses, and during his later years T. was a voluminous contributor to the *Monthly Review*. His principal works were translations of Bürger's *Lenore* (1796) and Lessing's *Nathan der Weise* (1805), *English Synonyms Discriminated* (1813), and *Historic Survey of German Poetry* (3 vols. 1828-30), the last now chiefly known by Carlyle's review. T. died at Norwich in March 1836. His pupil Borrow has sketched him in *Lavengro* (3d ed. 1873), and J. W. Robberds published his *Life and Writings* (2 vols. 1843), containing a correspondence with Southey and Sir Walter Scott.

Tay'lor, Zachary, twelfth President of the United States, son of the colonel of a Virginia regiment in the War of Independence, was born in Orange County, Virginia, 24th September 1784. He received a lieutenancy in the 7th Infantry in 1808, was made captain in 1812, and defended Fort Harrison, on the Wabash, with 50 men against a large force of Indians. Throughout the war of 1812 he was engaged on the western frontier with the Indian allies of the English, and was promoted to the rank of major in 1814. He served as colonel in the Black Hawk War of 1832, and in Florida, boldly following the Seminole Indians into their lair among the swamps, inflicted on them a crushing defeat at Okeechobee (1837), for which he was made brigadier-general. After commanding the army of the S.W., and serving on the Arkansas frontier, he proceeded to occupy Texas in 1845. He advanced to Fort Brown, on the Rio Grande, opposite Matamoras, in March 1846, and declining to retire beyond the Nueces on the request of General Ampudia, he was attacked by the Mexicans, who met at his hands the serious reverses of Palo Alto on May 8, and Resaca de la Palma next day. Matamoras fell without resistance, and here T. rested till September, by which time he had raised his small force to 6625 men. On September 9 he attacked, and after three days' fighting took, Montery, which had a garrison of 10,000 regulars. The plan of invasion was now modified by government, and just as T. was about to resume active operations he was ordered to send the greater part of his force to Vera Cruz, where the command had been given to General Winfield Scott (q. v.). With only 5300 effective troops, including 600 regulars, he was attacked by Santa Anna with an army 21,000 strong. Taking up a strong position, and nerving his band for a last effort of heroism, he rolled back the enormous odds, and gained the victory of Buena Vista, February 22-23, 1847. National enthusiasm was evoked, and the thanks of Congress and a gold medal were awarded the victor. 'Old Rough-and-Ready,' as he was called in the army, was nominated in 1848 for President over Henry Clay, General Scott, and Daniel Webster, and subsequently elected over General Cass, Van Buren, and Adams. This 'ignorant frontier colonel' had scarcely time to show how he would deal with the organisation of the newly-acquired territories, with the slave question, or the admission of California, before he died, after a three days' illness, July 9, 1850. One of his daughters was married to Jefferson Davis, and his son, **Richard T.**, fought with the Confederates at Bull Run, served under Stonewall Jackson in Virginia, and commanded as major-general first to the W. of the Mississippi (1863-64), and then in E. Louisiana. He surrendered May 4, 1865, but his force was the last that remained to the Confederacy.

Tay'lor's The'orem, one of the most important theorems in analysis, first demonstrated by Brook Taylor, and used by Lagrange as the basis of his functional calculus. It gives the means for developing a function of the sum of two variables in ascending powers of one of these variables with coefficients which are derived functions of the other. Thus, take any function $\phi\,(x+y)$, and let $\phi\,(x)$ or simply ϕ be its value when $y=o$, then by T.T.

$$\phi\,(x+y) = \phi + \frac{d\phi}{dx}.\ y. + \frac{d^2\phi}{dx^2}.\ \frac{y}{1.2} + \frac{d^3\phi}{dx^3}\ \frac{y^3}{1.2.3} + \&c.$$

or as Lagrange writes it symbolically—

$$\phi\,(x+y) = \phi x + \phi' xy + \phi'' x \frac{y^2}{1.2} + \phi''' x \frac{y^3}{1.2.3} + \&c.$$

Stirling's or Maclauren's theorem is derived from this by putting $x = o$, when we have—

$$\phi y = (\phi) + (\phi')\,y + (\phi'')\,\frac{y^2}{1.2} + \&c.$$

where (ϕ), (ϕ'), (ϕ''), &c., are what the functions become when the variable is put equal to zero. By this theorem any function may be expanded in ascending powers of the variable. In certain cases one of the functional coefficients becomes infinite for a particular value of x; and for this value of x the function fails to be developable. In such cases T.T. is said to fail. See De Morgan's *Differential and Integral Calculus* for a thorough investigation of the limits and failure of T. T.

Tchad, or **Tsad,** a large Central African lake, situated in 12° 30'-14° 30' N. lat., and 12° 30'-15° 30' E. long. It is roughly triangular in shape, shallow, with low shores bordered

by reeds, and according to Rohlfs is 1150 feet above the sea level. In dry weather its area is about 10,000 square miles, but in the rainy season, when its waters rise from 20 to 30 feet, its area is increased fivefold. The Shari (q. v.) on the S., and the Komádugu Yaobe on the W., are its principal feeders. The water of the lake is quite fresh, and fish, amphibia, and water-fowl abound in it. Lake T. has no permanent outlet, but occasionally discharges by the Bahr-el-Ghazal, a wide channel 300 miles long, which terminates in a great depressed plain, where the water is lost by absorption and evaporation. In the centre of the lake is an archipelago inhabited by a fierce piratical tribe, called the Budduma or Yedina, who are independent of Bornu (q. v.).

Tcherka'si, a town in the government of Kiev, Russia, on the Dnieper, 110 miles S.E. of Kiev. It has 6 Russian, 1 Protestant, and 1 Roman Catholic churches, a synagogue; manufactures beet-root sugar, and trades with France and Germany in wool, linen, spirits, cereals, and cattle. Pop. (1875) 13,914.

Tcherkask' Stàro ('old'), the former capital of the province of the Don Cossacks, S. Russia, on the Don, 12 miles S. of Novo-Tcherkask (q. v.). Standing in marshy ground, it is built on stakes and intersected by canals. Pop. 5000.

Tea is the dried leaf of an evergreen shrub of the natural order *Ternstrœmiaceæ*, for which the Linnæan botanical name of *Thea Chinensis* is generally current, though the genus *Thea* is by recent systematists merged in *Camellia*, and the plant is now called *C. Thea* of Link. It includes *C. Bohea*, the China plant, and *C. Theifera*, the indigenous Assam plant. At one time it was supposed that two Chinese species were grown, of which *T. Bohea* furnished the Black T. and *T. viridis* the Green T. of commerce, but further research has shown that these species cannot be maintained. The T. plant may be described as a glabrous or slightly pubescent shrub with elliptic-oblong, acuminate leaves; flowers solitary, on short 2-3 bracteate stalks, with five rotundate, very obtuse, persistent sepals, and white, obovate, obtuse petals; stamens many with versatile anthers, the inner five free; ovary 3-celled villous; styles 3, glabrous; capsule woody, smooth, splitting at maturity into three valves; seeds large, oily, with a hard, smooth, shining testa. Though the varieties are numerous, it is not at present possible to distinguish them within definite limits. The Assam plant is marked by more acuminate and more membranous leaves, is also stronger in taste, but far more susceptible to drought and frost than the China plant. Whether the T. shrub is indigenous in China and Japan is a doubtful question: so far as can be judged, pending the thorough botanical explorations of these countries, it appears to have been imported thither from Assam and Cachar, and possibly also from Siam and Cochin. The fact has been historically established that the culture of T. existed in China in the 4th c., and in Japan in the 9th c., and from these countries it was exclusively obtained for any other part of the globe until the time of the present generation. The import appears to have reached Europe during the early part of the 17th c., but we do not hear of any substantial arrival in England until 1657, and for a long time the high price kept its use limited to the wealthy class. At the present day it is estimated that half the human race use T. habitually or occasionally.

The discovery of the indigenous plant in the forest country of Upper Assam was made in 1834, and since 1840 its cultivation there has taken very firm root, as also in Cachar, Sikkim, the N.W. Himalaya, and other parts of India. The spread of T. field cultivation in N.W. India is mainly due to the late Dr. W. Jameson, who established Government plantations in Dhera Dhoon, Kumaon, Gurhwal, and Kangra. Since then private individuals and companies have taken part in extending its cultivation in these districts, the Government still, however, continuing to foster its growth, not with a view to immediate pecuniary profit, but simply to encourage so important an article of commerce. In one year they distributed to private planters upwards of 130 tons of seed, and 2,400,000 seedlings. In the Neilgherries also, the introduction of T. culture has proved a success, and there can be no doubt that the cultivation will still spread in India, land ranging over a district exceeding 1000 miles in length being more or less adapted to its growth. The production in Assam is spreading with almost unexampled rapidity. The estimated Indian crop for 1877-78 is 34,000,000 lbs.; and the Assam Tea Co., according to a recently-issued report (June 1878), in the preceding year shipped 2,039,324 lbs., yielding a profit of £46,494, giving a dividend of 25 per cent. to the shareholders. Into Java T. was introduced as an agricultural plant about 1835, into Carolina about 1845, into Brazil in 1860, and its culture in Australia is strongly advocated by such high authority as that of Baron F. von Mueller, Government-Botanist of Melbourne. In 1877 the total imports of the United Kingdom amounted to 187,515,284 lbs. (154,996,561 from China; 30,595,093 from Bengal and Burmah), value £12,480,740.

A damp, warm climate, with rains to the extent of 70 or even 100 inches, well spread over the year, and copious in spring, is above all adapted for T. culture. Rich forest-land in its virgin state is preferable to any other. Wide valleys with gentle slopes or undulations, or slightly-elevated level lands with natural drainage, are more eligible than steep hill-sides. Light loams of a reddish or yellowish colour crumbling throughout, of several feet in depth, with a surface stratum of decomposed forest foliage, is insisted on as the most desirable for the largest and most lasting yields. Low lands with any stagnant humidity are not fit for use until drained. The plants must be kept in vigorous growth by the suppression of weeds, periodical turning of the soil, judicious pruning, and adequate manuring. In India an elevation of 4500 feet down to 2000 feet is best. The number of T. plants per acre varies from 1860 to 2700 according as they are placed 5 feet or 4 feet apart. The yield per acre after the fourth or fifth year is approximately 240 lbs. in India and 320 lbs. in Assam. Picking and manufacture extend from April to October, during which period twenty pickings are calculated upon. Growers in India adopt a less complicated system of manufacture than that practised in China, as detailed by Mr. Fortune in his *Tea Countries of China*. The Indian plan for black T. may be shortly described. The operation of plucking is simply the removal from the bush by the finger and thumb of the young shoots with three or four leaves; the amount of the gathering by a labourer per day depending on the weather, the season of the year, the health of the bushes, and the quality of leaf wanted. The produce, after being weighed, is laid in a cool place, and the following day is spread out thinly on mats in the sun, whereby the leaf becomes sufficiently flaccid for rolling without much breakage. The rolling is slow and laborious handwork, performed on a common deal table, and unless conducted with uniformity, the next process of fermentation will also be irregular. The fermentation is effected by thoroughly shaking up the leaf, throwing it loosely into a heap, and covering closely with mats or carpets—the length of time required depending upon the quality and state of the weather. Then succeeds firing in metal pans at a temperature of 240° or 250°. After a few minutes of this treatment it is brushed out, thrown on a table, and again quickly rolled while hot. The same process of firing and rolling is repeated, and finally the leaf is exposed to the sun, or placed over charcoal fires to dry. Some planters send their tea to market as soon as manufactured; others store it till the close of the T.-making season, and by picking and sifting classify their harvest. The T. is generally packed in strong light chests and half-chests, containing 80 lbs. and 40 lbs. For making green T. the series of operations are somewhat different to the above, the firing being for a longer period and at a higher temperature, and instead of fermentation a little sweating only is permitted. Well-made green T. for bulk is nearly twice as heavy as black.

The youngest and therefore smallest leaves produce the most delicate flavoured T. In ordinary commerce four kinds of black and six of green T. are recognised, but the difference between them consists chiefly in size. In the first, *Congou* forms the bulk of the British import, *Pekoe* and *Souchong* being finer and dearer kinds, and *Bohea* coarser; and in the green the various *Hysons* and *Gunpowder* are most familiar. Hlassa brick T. is pressed in the form of a brick, and is prepared when used with butter and salt. It is preferred to all other teas by the natives of Central Asia and Thibet.

An infusion of T. as a beverage has trifling actual nutritive value, but it increases respiratory action and stimulates greater activity of the brain; its effect upon the nervous system being due to the essential oil and the theine, whilst the 14 per cent. of tannin it contains is an astringent.

Substitutes for T. have been found in a number of plants, some of which contain the same stimulating property, such as Maté (q. v.), Guarana (q. v.), Cola Nut (q. v.), and coffee-leaves. Others have been selected by our early colonists, &c.,

for infusion, and the cognomen T. has in consequence been given to the plants. Thus we have Australian T. for several species of *Leptospermum* and *Melaleuca*, Labrador T. is *Ledum latifolium*, Mountain T. is *Gaultheria procumbens*, New Jersey T. is *Ceanothus Americanus*, New Zealand T. is *Leptospermum scoparium*, Oswego T. is *Monarda didyma*, Botany Bay T. is *Smilax glycyphylla*, and W. Indian T. is *Capraria biflora*.

Teak (*Tectona grandis*), a large deciduous tree of the natural order *Verbenaceæ*, with oval or obovate leaves 12 to 24 inches long by 6 to 12 inches broad, white flowers in terminal erect panicles 1 to 3 feet long, and a sub-globose woolly fruit about the size of a cherry enclosed in the inflated calyx. It is indigenous in both peninsulas of India, in the eastern drier parts of Java, in Sumatra, and in some of the other islands of the Indian Archipelago. Much attention is now given to its cultivation in India, the finest T. plantation in that country being formed in 1844 by Mr. Conolly on the river Bepur, in Malabar, and called after him the Conolly plantation. One of the most valuable qualities of T. timber is, that once seasoned, it does not split, crack, shrink, warp, or alter its shape; but its principal value is its durability. In contact with iron, neither the metal nor the wood suffers—in this respect being far superior to oak. It does not, however, resist the attacks of the 'shipworm' (*Teredo navalis*). The various uses of T. are well known. In India it is prized for construction and shipbuilding beyond any other timber, and into Europe it is imported for railway carriages, for decks of ships, and the backing of ironclads. The leaves serve in its native countries for plates, to wrap up parcels, and for thatching; they also yield a red dye. African T. is also a valuable timber for shipbuilding purposes, &c. It is exported from the west coast of tropical Africa, but the tree which yields it is as yet imperfectly known to botanists.

Teal (*Querquedula*), a genus of swimming birds (*Natatores*), in which the bill is as long as the head, and has a horny tip. The second quill is longer than the others, and the nostrils are oval and placed at the base of the bill. The common T. (*Q. crecca*) is a familiar visitant of Britain in winter, although some specimens may remain in this country throughout the year. The T. is of a brown colour intermingled with a metallic green lustre, the back being mottled with white and black. The female is of a uniform dull brown. The average length is 15 inches. The T. is captured in large numbers by decoys, and T.-shooting is a favourite sport in fens and on swampy moors. The brimaculated T. (*Q. bimaculata*) is a second species, and the summer duck (*Pterocyanea circia*) is nearly related to the T. The mandarin duck (*Aix galericulata*) of China is also known as the Chinese T., the males exhibiting a plumage of the most highly variegated description; and the green-winged T. (*Q. Carolinensis*) and blue-winged T. (*Q. discors*) are two well-known species of N. American distribution.

Tea'sel, or **Tea'zel** (*Dipsacus*), the type-genus of *Dipsacaceæ*, consisting of erect, biennial, hairy, or prickly herbs with angular stems; leaves usually connate at the base; flowers numerous in oblong or cylindric heads, with rigid spreading involucral bracts and spinescent exserted floral bracts; corolla lobes 4, short, unequal; stamens 4; style filiform. There are about 17 species distributed through Europe, N. Africa, and W. Asia. Of these the wild T. (*D. sylvestris*) is a frequent plant of the hedgebanks and copses in Britain, growing to a height of from 3 to 4 feet, with stout, prickly, rigid stems, and purplish flowers in heads of from 2 to 3 inches long, with very prominent, stiff, subulate, floral bracts. The fuller's T. (*D. fullonum*) appears to be a cultivated variety of this plant. It may be distinguished by the flower bracts being hooked at the point. The heads form an article of considerable importance to the cloth manufacturer, who uses them, divided into halves and quarters and fixed in a large frame, for passing over the surface of his cloth until the required nap is raised by their strong but flexible hooks. Adequate machinery has not been invented to supersede them in delicacy of operation, and for the required supply the plant is extensively cultivated. In addition to the quantity raised by home farmers, imports are made into England from Europe to the extent of about £5000 annually, representing some twenty millions of T.-heads.

Tech'nical Instruc'tion embraces such branches of education as have a direct relation to the various arts and manufactures. The subject thus covers a very wide area, and includes many different methods and processes of instruction, such as school-training in the theoretical basis of various arts, and an apprenticeship system in which practical manipulation is taught. T. I., however, as understood since the agitation for its extension which arose in Great Britain chiefly after the Paris Exhibition of 1867, applies principally to instruction in those sciences which have a direct bearing on manufacturing industries, and in the principles which underlie mechanical and manipulative trades. The demand for increased attention to such subjects as come under the head of T. I. arise partly out of the fact that various Continental nations had instituted special schools of T. I., on the fostering of which they expend large sums of money to the manifest advantage of their industries, and also from the fact that the modern system of manufactures at once demands greatly increased technical knowledge, while it has rendered the acquisition of such knowledge in the workshop increasingly difficult. Thus the minute subdivision of labour greatly circumscribes the area of the artisan's practical knowledge, and the extensive application of machinery in many instances makes him, so far as his work is concerned, little more intelligent than the machinery itself. The Science and Art Department of the Committee of the Council of Education spends upwards of £300,000 annually on the subjects specified in the article Schools of Design and Art (q. v.), and also on the teaching of science in special schools, on science colleges at South Kensington, London, and in Dublin, on special museums of science and art, including South Kensington Museum, the Geological Museum and School of Mines, London, the Industrial Museums in Dublin and Edinburgh, and on the geological survey of the United Kingdom. Chairs of applied science are now being introduced into the universities, while the chief scientific foundations are Owens College, Manchester, the Newcastle College of Science, and the College of Science at Leeds. More specialised and limited schools, on Continental models, have also been founded in Bradford and Glasgow, devoted to instruction in the art of weaving. The various livery companies and the municipal corporation of London have jointly formed a board of governors of the 'City and Guilds of London Institute for the Advancement of Technical Education,' for which an annual income of £12,000 is already (1879) secured. The Institute is intended as a central technical school, to give assistance to evening classes, trade schools, &c., and to develop the system of technological examinations organised by the Society of Arts. The Commissioners of the Great Exhibition of 1851 have also resolved to realise and devote part of their funds to the foundation of a technical school at South Kensington, London.

Technol'ogy (Gr. *technē*, 'art,' and *logos*, 'a discourse') is a term of modern origin meant to indicate the scientific exposition of the principles upon which raw products and materials are prepared by human industry for commercial purposes. It includes within its scope, 1st. chemical T., embracing the industries which have to do with changing the chemical structure and composition of materials; and, 2d, mechanical T., in which only the form or shape of the substances operated on is altered or modified without affecting its essential composition. Of course, a large number of industries may be ranged partly under one and partly under the other of these heads, but T. is not to be regarded as in itself a science capable of strict systematic classification and limitation.

Tectibranchia'ta, a group of Gasteropodous Mollusca, in which the gills are concealed by the *mantle*. It includes such forms as the sea-hares (*Aplysiadæ*), bubble-shells (*Bullidæ*), &c. The shell is developed both in the larvæ and adults. The T. are contradistinguished from the *Nudibranchiata* (q. v.) or 'naked-gilled' gasteropods.

Te De'um is the name (from the opening words *Te Deum laudamus*) of a well-known hymn which is in almost universal use in the Church. According to the rubric for Matins in the Roman Catholic breviary, T. D. is always said after the last lecture on all Sundays, and on feasts only (except on the feast of Holy Innocents, when it does not fall on a Sunday) from Easter to Advent and from the Nativity to Septuagesima. But during Advent and from Septuagesima to Easter it is said only on feasts; from Easter, however, to Pentecost it is also said in the ferial office, except the second feria of Rogation Days. In the Anglican Church it occurs in the morning service after the first lesson. The authorship of the hymn is uncertain. By an

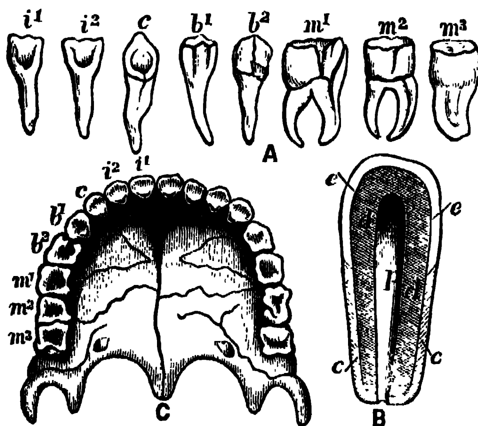
old tradition it is ascribed to St. Ambrose and St. Augustine jointly, the two having given utterance to their feelings in this inspired song when the latter was baptized by the former (386). Most probably it was composed for the use of the Gallican Church in the 6th c.

Teel-Seed. See SESAMUM.

Tees, a river of England, rises under Cross Fell, in Cumberland, flows E., forming the boundary between the counties of Durham and York, and after a course of 90 miles enters the North Sea 10 miles below Stockton, to which it is navigable for vessels of 60 tons. The scenery of Upper Teesdale is far-famed. At Holwich Force, 4 miles from Middleton, the T. is crossed by Wynch Suspension Bridge. Higher up is High Force, one of the finest falls in the kingdom, where the T. descends 69 feet over a mass of greenstone. The iron shipbuilding on the T. amounted (1878) to 12,587 tons.

Teesta (*Tista*), a large river of N. Bengal, India, which rises in the Thibetan Himalayas, and after breaking through Sikkim in a fine gorge flows S.E. into the Brahmaputra after a total course of 313 miles. It used formerly to flow S.W. into the Ganges, but the main stream was diverted by a great flood in 1785. The T. has a large traffic in rice, jute, and tobacco.

Teeth, the name given generally to hard parts developed in the mouth of animals. T., however, are not to be ranked as parts of the skeleton, although they are somewhat allied to bone in chemical composition, and attached in higher animals to the skeleton itself. On the contrary, they belong to the exoskeleton or outer structures of the body. They are developed from the *dermis*, or under of the two layers of the skin, which layer, in a modified state, forms the gum or lining membrane of the mouth. The history of the *development* of the T. clearly shows the origin and true nature of these structures. Thus in man we find a groove to make its appearance in the jaw of the embryo at about the sixth week of intra-uterine life, this groove being the *primitive dental groove* of Goodsir. In this groove small projections or *papillæ* arise, these being the moulds upon which the T. are formed. The papillæ become thereafter shut off into separate sacs or follicles. The enamel of the tooth is formed by a little cap of the papillæ, whilst the body of the tooth is formed by the papilla itself, the substance of the papilla ultimately becoming the *pulp* of the fully-formed tooth. When the T. are fully advanced in development, they pass through their covering constituted by the gum, and are then said to be 'cut.' Such is the history of the development of the milk-T., or first or temporary set which man is known to possess. The second T. are formed in little sacs or bags which



TEETH OF MAN.

A, The teeth of man, removed from the half-jaw to show their form; i^1 i^2, incisors; c, canine tooth; b^1 b^2, bicuspid or præmolar teeth; m^1 m^2 m^3, molars. B, Section of incisor tooth of man, to show its structure; c c, cement; d d, dentine; e e, enamel; p, pulp-cavity. C, Teeth of human subject, as seen *in situ* in the upper jaw. References as in upper figure.

exist as processes of the sacs or follicles in which the first T. are developed. T. are thus proved to be wholly *dermal* or *skin structures*, and to have no relationship, in so far as their structure or nature is concerned, with the skeleton itself.

Regarding the nature and structure of the T., we may select those of man by way of familiar illustration, and prior to examining the comparative anatomy of the subject. The ordinary structure of a tooth is well illustrated by the diagrammatic section of an incisor or front tooth of man.

The body of the tooth (*a*) is composed of a substance to which the name of 'dentine' or 'ivory' is given; the fang or root is invested by a layer of 'cementum' or 'cement' (*c c*); while the 'crown' is covered by a substance of great hardness termed 'enamel' (*e e*), and which serves on this account to protect the 'crown,' and prevent the too rapid attrition or wear of the tooth. Internally, the pulp-cavity (*p*) of the tooth is seen. It contains a highly-vascular tissue, richly supplied with nerves, and termed the 'dental pulp;' the development, growth, and nourishment of the dental tissues being carried on by means of this structure.

Regarding the form and functions of the T., four varieties are to be distinguished. The first kind comprehends the 'incisor' or 'cutting' T. (A,C,*i*). These are placed in the front of the jaw (C, i^1 i^2), and are characterised by their sharp chisel-like edges. Functionally, the incisors are, as implied by their name, the 'cutters' or 'dividers' of the food, and in the *Rodentia*, exemplified by the hare, beaver, &c., the incisor teeth are greatly developed, and form the organs with which the 'gnawing' operations of these creatures are carried on. The second series of T. are known as the 'canine' or 'eye' T. (A, C, *c*). These are situated next the incisors in each side of the jaw, and derive their name from the fact of their especial development in the *Carnivora*, exemplified by the lion, dog, &c. The 'bicuspid,' 'præmolar,' or 'false molar' T. (b b^2), succeed the 'canines,' and are distinguished by their relatively broader crowns, each 'bicuspid' tooth bearing on its crown two points or cusps, from the possession of which the name is derived. The fangs of the 'bicuspid' T. further exhibit a tendency to become bifurcated, or divided in two. The fourth and last variety of T. is known as the 'molars' or 'grinders' (A, C, m^1 m^2 m^3): these T. having two or even three fangs, and being distinguished by their broad flattened crowns, which adapt them for the particular function of crushing and grinding the food. The molars of the upper jaw in the human subject have four cusps, while those of the lower jaw are provided with five points. The 'deciduous' or milk set of T. are composed of three kinds of T. only; incisors, canines, and præmolars; the true molars being thus unrepresented in the milk set, and making their appearance for the first time in the permanent set.

These various and typical varieties of T., although fully represented in the higher forms, are not necessarily present in their entirety throughout the whole class; on the contrary, we find many and very great modifications in the number and disposition of the T. as we descend the scale; the arrangements varying of necessity with the life and habits of the animal.

The *scientific definition* of teeth is founded upon the position and implantation of these organs in the bones to which they are attached. Thus an upper incisor is a tooth implanted in the premaxilla; an upper canine is the foremost tooth of the maxilla provided it is not at a considerable distance from the front of the bone, in which case it would most likely be a præmolar. A lower canine bites in front of the upper canine, and lower incisors are placed in front of or in a line with the lower canine. Præmolars are T. behind the canines and in front of the molars; but it may be necessary to define præmolars (in the absence of molars) as T. behind canines and having vertical predecessors, or in front of molars which have such predecessors. The *number* of T. in vertebrates varies exceedingly, as do also the situation, succession, and form of these organs. Thus, in man's class, the dolphins may have even 200 T. A species of armadillo possesses 90; and in fishes the T. are so numerous as to defy computation. Some fishes (*e.g.*, hog-fishes) may have but a single tooth in the palate. Ceratodus (q. v.) has but two; while such fishes as the pike, perch, &c., have a very large supply. In man and higher animals generally, T. are confined to the jaw-bones; but in fishes they may be borne by any and every bone which enters into the composition of the mouth. T. are not invariably fixed in *alveoli* or sockets. Only in mammals, indeed, is this mode of implantation exemplified. In fishes the T. as a rule are attached to the bones by ligament or by bony union. The latter is the method

of attachment in *Reptilia* at large. In lizards, the T. are attached by bony union to the top of the jaw-bones. Such lizards are *Acrodonts.* In others the T. are attached to the outer side of the jaw, when the animals are named *Pleurodonts.* T. as a rule grow from pulps which sooner or later become absorbed, so as to arrest the growth of the tooth beyond a certain stage. In some animals (*e.g.*, elephants and rodents), certain of the incisor T. grow from *permanent pulps*, and continue to increase during the whole life of the animal; with the result of producing the well-known 'tusks' or T. which serve for purposes of gnawing. Canine T. become tusk-like through a similar development of these pulps in such animals as walruses and pigs: one of the *Suidæ*—the Babyroussa hog—possessing curious twisted canines in both upper and lower jaws. The Narwhal's (q. v.) long ivory pole is simply a highly-developed tooth. The *succession* of the T. varies equally with their form and number. Man and most mammals have two sets, and are therefore named *diphyodont.* Other mammals (*e.g.*, toothed whales and *Edentates*) have but one set, and are named *monophyodont.* Among lower vertebrates we may find an unending succession of T. to be the peculiar possession of certain forms. In *Crocodilia* the T. succeed each other from below upwards during the entire lifetime of the animal: and in such fishes as the sharks, rays, &c., row after row of T. is developed, to replace those which are lost or worn away.

Diseases of the T.—The T. are liable to various malformations, accidents, and diseases, the more important of which are the following:—

1. *Irregularity of the Permanent T.* may be the consequence of contracted and ill-formed jawbones, or of stomatitis depending upon congenital syphilis. If the canine T. or incisors project, much may be done to remedy the deformity by persevering efforts to push back the tooth by the fingers; but if this should fail, the projecting tooth may be removed, or one of the bicuspids may be extracted to make room for it. When the under incisors come in front of the upper ones, the deformity may sometimes be rectified by pushing the upper teeth forward with the tongue and fingers, or the upper T. may be pressed forward and the lower T. backward by putting the end of a spoon-handle behind the upper incisors and pushing them forward, using the lower incisors as the fulcrum of the lever. The wisdom-T., especially of the lower jaw, are extremely liable to displacement, and may produce ulceration of the cheek or tongue, necessitating extraction.

2. *Fracture and Dislocation of T.*—When a portion of a tooth is broken off without exposing the pulp cavity, the exposed surface should be filed smooth; but if the pulp cavity is exposed, it should be touched with lunar caustic, and an artificial tooth may be afterwards fastened to the stump by a pivot. When a tooth is loosened by a blow, it should be fastened to its neighbours by a ligature; and should it be entirely driven out, it should be replaced and similarly fastened after the bleeding has ceased.

3. *Caries of the T.* generally commences in the dentine immediately below the enamel. The tissue becomes softened, and a cavity is formed extending outwards towards the enamel and inwards towards the central or pulp cavity. The unsupported enamel gives way, and irritant substances, heat, cold, &c., find entrance to the pulp cavity and cause excessive pain. The pulp cavity is attacked by inflammation, suppuration, and ulceration, and the tooth, deprived of its nourishment, decays, nothing being left but the outer coating of enamel, which breaks away by degrees. Caries is a frequent cause of toothache, headache, earache, deafness, photophobia, and occasionally of strabismus. In such cases there may never have been toothache, but the neuralgic symptoms may disappear when the diseased T. are removed. *Treatment.*—If the caries be slight and recent, the decayed portions may be removed by proper instruments and the cavity filled up; but if the decay has advanced far towards the pulp cavity, or has laid that open, it may be necessary to deaden the sensibility of the tooth, so as to enable it to bear the stopping and protect it meanwhile from contact with food or saliva. This may be effected by various means, such as filling the cavity with a bit of cotton wool dipped in a solution of mastic, in eau de Cologne, in alcohol, or in a solution of gutta-percha in chloroform.

4. *Necrosis of the T.* is characterised by blackness of the teeth and looseness of its socket, and may be caused by violence, or by inflammation of the pulp; or, secondarily, by necrosis of the jaw resulting from the poisonous action of phosphorus fumes, or from the specific poison of certain eruptive fevers.

5. *Toothache* is not so much a disease as a symptom of various diseases of the T, and of contiguous parts. Toothache may be caused by inflammation and suppuration around the fang of a tooth, the matter making its way to the surface either along a canal by the side of the fang of the tooth opening at the edge of the gum, or through the gum itself at a point corresponding to the end of the root of the tooth implicated. In its earliest stage the tooth may be extracted, or the gum may be freely lanced and hot poultices applied to the swollen part of the face, and when matter is detected a puncture should be made through the gum. In general, the removal of the tooth is necessary. Toothache may be inflammatory, neuralgic, rheumatic, and gouty. *Inflammatory* toothache depends generally upon caries, and the seat of the inflammation may be in the pulp of the tooth, in the nerve-twig entering the pulp cavity, or in the periosteum investing its roots. The tooth is excessively tender, and the pain is aggravated by pressure, and by hot and cold liquids taken into the mouth; and if the part be much irritated, it is liable to acute inflammation with most agonising toothache. The following treatment has been recommended:—'Let the patient have a dose of calomel and colocynth; confine himself to spoon diet; let him wash out the mouth with a solution of carbonate of soda in water; let the gum around the tooth and between it and its neighbours, if tumid or tender, be deeply scarified with a fine lancet, then let the cavity be filled loosely with a little bit of cotton dipped into a solution of tannin and mastic formed by dissolving a drachm each of tannin and mastic in an ounce and a half of sulphuric ether; and if the toothache is curable at all, this plan, with a little patience, will be almost sure to succeed. If the pain is very violent, half a grain of powdered acetate of morphia may be taken up with the cotton imbued with the tannin, which should be warmed before it is put into the cavity. In some cases a whiff of chloroform will lull the pain. As soon as the pain is relieved, the tooth, if of use, should be stopped, and if of no use it should be extracted.' A drop of strong solution of nitrate of silver, or solution of alum or of tannin, introduced into the cavity of the tooth, may afford relief. *Inflammation* of the central pulp may affect a tooth that is apparently sound, causing severe pain in the tooth extending to the head, and in such cases leeches may be applied to the gums, and purgatives should be administered. *Neuralgic* toothache may occur in T. that are entirely sound or partially carious, and is characterised by paroxysmal pains which come and go suddenly at more or less regular intervals, there being little or no swelling of the gums. It is very common during the earlier months of pregnancy, and often depends upon changes of the weather among those of a neuralgic tendency. The treatment consists in the administration of aperients followed by quinine in large doses. *Rheumatic* and *gouty* toothache is common to persons of the rheumatic and gouty diathesis, and may occur in connection with sound or carious T. In general the pains fly about the jaw, affecting no tooth in particular, and the pain is not relieved by extraction. Muriate of ammonia in half-drachm doses may be given every four hours, and other medicines used in the treatment of rheumatism and gout.

Hæmorrhage after Extraction of T. may be arrested by stuffing the socket with lint saturated with turpentine or perchloride of iron or solution of tannin, and applying a compress of lint or a piece of cork thicker than the bodies of the adjacent T., so that the T. in the opposite jaw may keep up a pressure. See DENTISTRY and DENTITION.

Teff. See MEADOW GRASS.

Tef'sa, or **Tefza**, a town at the foot of the northern face of the Atlas range and on the river Um-er-beg, 135 miles N.E. of the city of Morocco. It is the centre of the fertile district of Tadla, and has manufactures of woollen cloth and shawls. Pop. 10,500.

Teg'nér, Esaias, Sweden's most famous poet, was born at Kyrerud in Värmland, November 13, 1782. In 1799 he entered the University of Lund, where he studied theology and philosophy, and became 'Adjunkt' of Æsthetics in 1805, and Professor of Greek in 1812. After he had been elected to the Swedish Academy (1818), and graduated in theology, he was appointed Bishop of Wexiö, where he died, November 2, 1846. The first great works of T. were his *Svea* (1811), crowned by the Academy; the idyl *Nattvardsbarnen* (1821; Ger. trans. by Möhnike, 5th ed. Halle, 1876), and *Axel* (1822; Ger. trans. by Vogel, Leip.

1876), whose subject is drawn from the age of Karl XII. It was by his *Frithjofs Saga* (1825; *ed. de luxe* by Malmström, 1868) that T. won his highest fame. This poem has been translated into almost every European language. Its German translations number nineteen, of which the best are by Simrock (3d ed. Stuttg. 1875), Zoller (Leip. 1875), Von Kleinburg (9th ed. Berl. 1875), and Möhnike (14th ed. Leip. 1877). Two works left incomplete at his death are *Helgönabacken* and *Gerda*, the latter an epos placed in the time of Valdemar the Great. T.'s *Samlade skrifter* have been published by his son-in-law Böttiger (7 vols. Stockh. 1847-50; last ed. 4 vols. 1871-72), and his posthumous works by El. Tegnér (3 vols. 1873-74). In poetry T. holds a place between the blind imitators of French models and the 'New School' of Atterbom, that found its ideal in German Romanticism. His rich humour and lively fancy, his warm and manly feeling, and his wealth of high thoughts expressed in noble forms, entitle T. to rank among the greatest of recent poets. His minor pieces are instinct with strength and freedom, and move with the easiest idyllic grace. The critic Georg Brandes, in a monograph on T. published in 1878, ranks him as a poet below Runeberg and Bellman, but thinks he is 'far more genuine' than they, 'a whole man; an honest, ingenuous mind with an ardent love for the beautiful and true.' See Böttiger, *Teckning af T.'s Lefnad;* Waldeck, T.'s *Stellung zur Theologie und Philosophie* (Stuttg. 1863); and Brandes in the *Deutsche Rundschau* for May 1878.

Teheran', the capital of Persia, province of Irak-Ajemi, in a sandy, stony plain which is 3447 feet above the sea, and stretches along the S. base of the Elburz Mountains (q. v.), 70 miles S. of the Caspian Sea. It is girt by a mud wall 4 miles in circuit, 20 feet high, and pierced by five gates; and the houses, mostly insignificant, mud-built structures, are ranged in narrow, crooked, filthy streets. On the N. side is the great fortified palace of the Shah, around the gardens of which are ranged the mint, prison, military school, &c. T. has eleven mosques, several of imposing appearance, various theological schools, a teachers' training-school, with library (founded 1850), large modern bazaars (notably Taki-Khan, finished 1851, at a cost of £30,000), numerous caravanserais, and baths. Within the town, especially in the N., are many fine gardens. In the vicinity are the Shah's palaces of Negristan and Niaveran, and the ruins of *Rhagä*, the *Rhages* of the Apocrypha, the classical *Ragæ* and the birthplace of Harun-al-Raschid. T. is the centre of a considerable trade with Europe, carried over the route from Poti on the Black Sea *viâ* Tiflis, Tabriz, and Kazbin. It manufactures iron-wares, tapestry, silks, and (since 1861) cottons. Pop. 80,000, greatly increased during the presence of the court in winter. The wealthier citizens are driven to the hills in the N.W. early in spring by the intolerable heat and bad exhalations. T. was chosen as a residence by the Shah in 1796, its sole recommendation being its proximity to his ancestral tribe, the Kujjurs. The Russian government has arranged to continue the Poti-Tiflis railway to T., and in addition has projected another line thence from Enzele, a Caspian port near Reshdt. The surveys of the latter line were completed by Austrian engineers in December 1878, and, by agreement with the Shah, the first sod is to be cut on March 2, 1879. The work, it is calculated, will take two and a half years, at the end of which an extension is to be made from T. to Bushire within the following three years. The whole line, linking the Caspian and Persian Gulf, is to be opened by 1887.

Tehuantepec', a town on the Pacific coast of Mexico, on the isthmus of the same name. It stands on the T. river, 11 miles above where it enters the great Gulf of T. The town has sixteen churches, including one erected in 1530 by the native tribe of the Zapotecos. Leather, cotton, salt, and indigo manufactures and pearl fisheries are the main industries. The pop., which is composed of Indians and half-breeds, and a few of pure Castilian blood, is about 14,000. The Isthmus of T. is a strip of Central America between the Gulf of T. and the Gulf of Mexico. The total distance across from N. to S. is only 143½ miles. The range of the Cordilleras is here suddenly broken for about 20 miles. Moreover, the river Coatzacoalcos, navigable for ships for 30 miles, flows in the line of the Isthmus into the Gulf of Mexico. Hence frequent efforts have been made to carry a railway or a ship-canal across the Isthmus. In 1814 the Spanish Cortes authorised the making of a canal. Other efforts have since been made. A United States company (the T. Railway Company) got a concession in 1867. The United States Government had it surveyed, with a view to a ship-canal, in 1870-71 by Captain Shufeldt. See *Reports of Exploration*, &c., *Ex. Doc. No. 6* *Senate*. See also *Isthmus of T.*, by Major Barnard (New York, 1855).

Te Ig'itur, one of the service-books of the Roman-Catholic Church, is properly an extract from the Missal. It contains the canon of the Mass, from the first words of which—*Te igitur, Clementissime Pater*—it derives its name, and certain other portions of the Liturgy which do not vary with the seasons or the festivals.

Teign'mouth, a seaport and watering-place of S. Devon, 15 miles S. of Exeter by rail, stands on the N. bank of the mouth of the Teign, which is here spanned by a bridge (1827) 557 yards long. Numerous villas have sprung up on the hills to the N. and along the 'Den,' a public lawn stretching ¾ths of a mile above the beach, and a promenade pier was constructed (1866). The two Anglican churches, St. Michael (with a good chancel 1872) and St. James, are poor edifices of the early part of the present century; but a fine Roman Catholic church, in Geometrical Decorated style, has been built (1878) in connection with St. Scholastica's Abbey (1865). Other buildings are the public assembly rooms (1826), theatre (1849), market-house, public baths, &c. Beyond shipbuilding (6 sailing vessels of 400 tons in 1873-77) and fishing (employing 476 hands in 1878), T. has no special industries, but there is a considerable trade, its harbour being entered (1877) by 470 vessels of 53,163 tons and cleared by 375 of 38,476, whilst on December 31 of that year 46 ships and 116 fishing-boats were registered as belonging to the port. The exports (pipe and potter's clay and granite) amounted (1877) to £5934; the imports (coal, culm, timber, &c.) to £50,583, the customs to £2280. T. publishes three weekly newspapers, and has a pop. (1871) of 6751. T. was burnt by the Danes (930) and French (1338 and 1690), on the last occasion losing 116 houses.

Teign'mouth, Lord. See SHORE, SIR JOHN.

Teinds (Mœso-Goth. *taihund*, 'the tenth part'), the name given in Scottish law to Tithes (q. v.). *Personal* T. are unknown in Scotland. *Predial* T., which affect the fruits of the land, are either *natural* or *industrial*, of which the industrial correspond to *mixed* tithes. In Scotland, until T. came to be regulated by the valued rental, there was hardly any teinding of *natural* fruits, so that predial tithes of industrial fruits have all along, with a few local and consuetudinary exceptions, constituted the whole T. leviable by the Church in Scotland. T. are *debita fructuum*, not *debita fundi* (see DEBITUM FUNDI); their arrears therefore do not affect a Singular Successor (q. v.). Formerly there were in Scotland two classes of clergymen. There were the clergy of the *mensal* churches, *i.e.*, churches, during the time of Episcopacy, appropriated by the patron to the bishop as part of his benefice. These, as regards their incomes or stipends (see STIPEND), were, between the Reformation and the abolition of Episcopacy, at the mercy sometimes of the bishops, at others of the Crown. They have now permanent stipends allotted to them by commissions from the bishops' tithes, now attached to the Crown. The second class whose stipends had never since their original appointment been given out remained proprietors of the full T. until it was given in 1649 to the patron, as a solatium for his loss of presentation; while a stated provision for the clergy was imposed as a burden on the patron on his retention of the T. after recovery of the right of presentation. Besides other powers granted to the commission of T. in 1633, they were authorised to affix reasonable stipends to the parochial clergy out of the tithes.' This power is now vested in the Court of Session (see AUGMENTATION, PROCESS OF). £150 is the minimum annual value of a church living in Scotland. If the T. are insufficient for this, the deficiency is made up by the Exchequer.

Tejucigal'pa, a town of Honduras, Central America, on the Rio Grande, 40 miles S.E. of Comayagua, is the capital of a department of the same name, and contains a university and cathedral. Though it has decayed considerably, owing partly to the emigration of some of the Spanish families, and partly to the exhaustion of the gold and silver mines, it is still an important city. Pop. 12,000.

Tek'eli. See TÖKÖLY.

Telamo'nes, the name given by the Romans to male colossal figures supporting balconies, cornices, &c., and thus corresponding to the Atlantes (q. v.) of the Greeks. They were so called after the mythic hero Telamon, the son of Æacus and father of Ajax by Peribœa, who was one of the Argonauts and Calydonian hunters, and accompanied Hercules in his expedition against Laomedon.

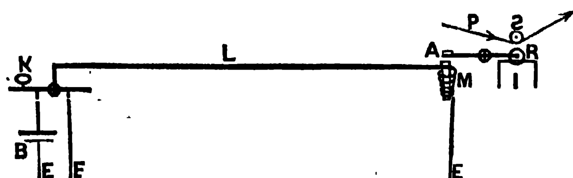
Tel'edu (*Mydaus meliceps*), a species of *Carnivorous* mammal found in Java, and allied to the Weasel (q. v.). Its colour is a blackish brown, the under parts being lighter. The feet and claws are large, and adapted for burrowing. The food consists chiefly of insects.

Tel'egraph (Greek, *tēle*, 'afar,' and *graphō*, 'I write') is any instrument fitted to convey intelligence beyond the limits of distance at which the voice is audible. Beacons, flags, trumpets, drums, gongs, guns, rockets, and other signals, have been and are still in certain circumstances used for purely telegraphic purposes, and of all such methods the most complete was the French Semaphore (q. v.) system, introduced by M. Chappe in 1794. The word *telegraph*, however, is now usually restricted in its application to the electric T., the history and nature of which we shall consider shortly. The first detailed scheme seems to have been described in a letter to *Scots Magazine*, written on February 1, 1753, from Renfrew, and signed C. M., the initials, according to Brewster, of one Charles Marshall. He suggested transmitting a charge from the conductor of an electrical machine at the sending station along an insulated wire to a conductor at the receiving station, the presence of the charge being indicated by the behaviour of a light pith ball, or by the passage of a spark. Each letter of the alphabet was to have a separate wire, so that any word might be spelt out, and thus any message sent. The possibility of transmitting frictional electricity had been already demonstrated in 1747 by Dr. Watson, who exhibited electrical effects at a distance of 2 miles from the source of excitement. Schemes essentially the same in principle, but differing in more or less detail from the above, were suggested and experimentally tested by Lesage (1774), Lomond (1787), Reusser and Böckman (1794), Cavallo (1795), Salva (1796), Bétancourt (1798), and Ronalds (1816); but an insurmountable difficulty in all these attempts was the impossibility of securing a sufficiently good insulation for long distances. More easily managed in this respect was current electricity, which, though discovered by Galvani in 1791, was of no practical interest till Volta in 1800 afforded an easy means for its production by the invention of the cell and battery. But how was the passage of a current in a conductor to be detected? Its physiological action, as in Galvani's original experiment, was very slight for weak currents, as also its decomposition of water, which, Sömmering employed in 1809, and the expense of maintaining a powerful current through a long length of circuit rendered such methods impracticable. With Œrsted's great discovery, however, of the action of a current upon a magnet in its vicinity (1820), we enter upon a new and more hopeful epoch. In that year Ampère and Ritchie attained a certain success in the construction of a telegraphic model with 30 needles and 60 wires, and in 1829 Fechner devised a similar T. of 24 needles and 48 wires. The expense of such complicated apparatus, however, was still too great. In 1832 the idea occurred to Baron Schilling von Canstadt of using simply one needle and two wires, and of expressing the different letters of the alphabet by different combinations of right and left deflections, produced by sending the current round the circuit, first in one direction, then in the other. Before he had tested this idea experimentally, Gauss and Weber, in 1833, had stretched two wires from the observatory to the physical cabinet at Göttingen, and at their suggestion Steinheil, in 1837, constructed a similar T. between the Academy at Munich and the observatory at Bogenhausen, 3½ miles distant. These physicists employed magneto-electric instead of voltaic currents. The last named also discovered that a return wire was unnecessary if the extremities of the other wires were taken to earth, and devised a method for automatically registering the communication upon a strip of paper moved uniformly along by clockwork. Meanwhile in England Cooke and Wheatstone were patenting their five-needle T., an improvement upon Schilling's apparatus, a model of which Cooke had seen at Heidelberg in 1836. The twenty necessary letters of the alphabet (*c*, *j*, *q*, *u*, *x*, *z* were not represented) were indicated by the mutual convergence of two of the five needles, each of which, with its corresponding needle at the other station, was worked by a separate wire. This was really the first successful working T., and was erected on a portion of the Great Western Railway between Paddington and Slough, a distance of nearly 20 miles. To Wheatstone is also due the construction of the alarm or electric bell, worked by means of an electro-magnet. To the other extremity of the hammer of the bell a piece of soft iron is attached, which is set opposite to the pole or poles of an electro-magnet (see ELECTRICITY and MAGNETISM). Each station is provided with such an apparatus, which is worked by the current from the other station. When the current passes through the electro-magnet coil, the soft iron armature is attracted to the electro-magnet, and the hammer is simultaneously raised. This action, however, by a simple device breaks the circuit, the electro-magnet ceases to act, the soft iron armature is released, and the hammer by its own weight returns to its normal position, at the same instant giving the alarm. Simultaneously the circuit is again completed, and the hammer raised to once more break the circuit and descend to give the alarm, and thus the action automatically repeats itself till the attention of the operator is directed to it. Other forms of bell have been invented by later electricians. Cooke and Wheatstone's original T., however, and their later letter-showing dial T. (1839), in which, by the action of an electro-magnetic touch upon the pullets of an escapement moved by clockwork, the letters of a given word appeared successively at an opening in the dial, were too cumbersome and expensive to allow of more than a restricted use. Nevertheless, their success was sufficient to warrant the formation of an Electric T. Company, which bought Cooke and Wheatstone's earlier patents for £120,000, and was soon involved in lawsuits with other inventors who were supposed to have infringed the patents. In this the company was generally unsuccessful; but by paying exorbitant prices to the inventors, or by compounding with them in some way, it managed for a time to secure a monopoly. One of its most formidable competitors was Alexander Bain, an Edinburgh watchmaker, and he was made a director, receiving at the same time £12,000 for his chemical printer. Nott and Gamble, Highton, Ward, Holmes, Henley, and Foster are the most important of Wheatstone's early contemporaries, but it is impossible here to do more than mention them. Of Wheatstone's own later improvements and inventions, the single and double needle instruments may be here noticed. In these the different letters were represented by different combinations of right and left deflections, produced on the needles at the sending and receiving stations by the current which by a simple arrangement could be sent round the circuit in either direction. These needles, however, required a considerable strength of current to move them; and to send such a current directly through a long circuit was not only expensive, but would have proved injurious to the material composing the circuit. To meet this difficulty Wheatstone invented the *relay*, which by a simple electro-magnetic arrangement substitutes for the weakened current a stronger current from a local battery. By these later improvements, Wheatstone did much to simplify the methods of telegraphy; but still simpler, inasmuch as it requires no reversal of current, is the 'dot-and-dash' system introduced by Morse in America about 1836. The alphabet code was similar in principle to Wheatstone's later right-and-left combinations, only instead of right-and-left deflections short and long currents were used, by combining which, two, three, and four together, all the letters could be represented. Representing the short current by a *dot*, and the long current by a *dash*, the Morse international code, which is now universally employed, is as follows:—

a	·—	j	·———	s	···
ä	·—·—	k	—·· ·	t	—
b	—···	l	·—··	u	··—
c	—·—·	m	——	ü	··——
d	—··	n	—·	v	···—
e	·	ñ	——·——	w	·——
é	··—·	o	———	x	—··—
f	··—·	ö	———·	y	—·——
g	——·	p	·——·	z	——··
h	····	q	——·—	ch	————
i	··	r	·—·		

1	· — — — —	6	— · · · ·
2	· · — — —	7	— — · · ·
3	· · · — —	8	— — — · ·
4	· · · · —	9	— — — — ·
5	· · · · ·	10	— — — — —

Having thus traced the rise of telegraphy, it remains to discuss in more detail the forms of apparatus which are generally used. Telegraphic instruments may be divided into two great classes—those which transmit signals by purely conventional signs, *i.e.*, by means of a code; and those which show and record the signals by means of the ordinary letters of the alphabet. Those belonging to the former class have the advantage of simplicity; while those belonging to the latter have the advantage of less chance of error, and do not require special training to read the messages as they are received. For general telegraphic business the first class of instruments is the best; and in these all signals are made by alternately breaking and making the current. The code is made up of combinations of long and short currents, as in the Morse alphabet, or of combinations of positive and negative currents, as in Wheatstone's single-needle T. In the Morse T., the operator, when he wishes to send a current, simply depresses a key, which when released is brought back to its original position by means of a spring, so that the current is interrupted. A short depression gives the *dot*, a longer the *dash*. At the receiving end dots and dashes corresponding exactly to the short and long currents are impressed upon a



long strip of paper by a very simple device, the principle of which is shown in the figure. By pressing down the key K, the line L is connected with the one pole of the battery B, whose other pole is to earth. Since the other end of L is also to earth, a current flows as long as K is kept down. This current at the receiving station is directed round the coil of an electro-magnet (M), which attracts the armature A to it as long as the current flows. This armature is attached to the one end of a lever which works on a central pivot, and which has at its other extremity a narrow roller R. This roller is continually revolving in an ink-trough I, out of which it is raised when the armature A is attracted by the electro-magnet. This action brings the inked roller into contact with the strip of paper P, which is being moved uniformly along by clockwork in the direction of the arrow-heads. The longer the duration of the current, the longer the electro-magnet keeps the armature depressed, and the longer the ink-mark upon the paper which is moving uniformly on the roller S. A complete Morse ink-writer, as used in practice, combines of course the clockwork by which both the roller and paper are kept in motion. Instead of an inked roller, a style making an indentation may be and was formerly employed; but in all, the principle of action is essentially that described above. Bain's chemical T. may be substituted for the Morse receiving instrument, and in it no electro-magnet is required. The current is directed through a steel style which presses upon a strip of paper soaked in a mixed saturated solution of ferrocyanide of potassium and nitrate of ammonia. The style and paper together press upon a metallic surface, over which the paper is drawn by clockwork, and through which the current after traversing the style and paper finds its way to earth. The passage of the current through the paper is accompanied by a chemical reaction between the salts present forming Prussian blue, so that the short and long signals are represented by blue dots and dashes. As already pointed out, for long distances the *relay* is used for retransmitting the original signal from a fresh battery. The ordinary Morse ink-writer can easily be arranged as a relay, so that the same action which registers the message at one station retransmits the message from that station to a farther one, and so on. On the Indo-European line from London to Teheran there are five relay stations in the circuit. A simple Morse or single-needle instrument can be worked by a skilled operator at the rate of about 30 words per minute, while receiving instruments can record more than 100 words per minute. To increase the rate of sending, electricians have devised automatic transmitters, the most successful of which is Sir Charles Wheatstone's. In it the order and succession of the currents are determined by perforated bands of paper, which are prepared beforehand by means of the *perforator*. Each strip is perforated in three rows of holes. The holes in the central row are uniformly spaced. Those on either side are not so, but represent the Morse dots and dashes according to the side on which they are. The strips of paper so prepared are then inserted into the *transmitter*, the uniformly-spaced central holes serving to move the paper on at a constant rate. Whenever a side hole comes, contact is made through it by means of a little metallic plunger; and according to the side on which the hole is, the resulting current is in the positive or negative direction. A slight modification renders Wheatstone's automatic transmittor applicable to the short and long Morse signals instead of the positive and negative signals. Of the second class of telegraphic instruments, Wheatstone's letter-showing T. has been already mentioned; and a modification of it is not uncommon for private lines in large establishments. It simply shows the letters, and does not print them. The typical telegraphic printer is Hughes' T., invented in 1855. The essential principle is the synchronous movement of two constantly revolving type-wheels, with correspondingly situated letters on their circumferences, at two different stations. There is a circular row of twenty-eight vertical pins connected with the same number of piano-keys. The depression of a key raises the corresponding pin, which is thus brought into contact with the revolving contact-maker at the very instant that the corresponding type on the synchronously revolving type-wheels at both stations is passing the roller over which the strip of paper is stretched. At this instant the paper is struck against the edge of the rotating wheel, and the letter printed without the wheel being sensibly retarded. The paper is then pulled on a step by clockwork, to be in readiness for the next letter. Various modifications and improvements have been introduced by other inventors, especially in America, where the names of Phelps, Edison, Gray, and others attest their activity in this direction. The autographic processes of Bakewell, Caselli, and Bonelli depend also upon synchronous motion at the two ends of the line, the writing-like impression being made on chemically prepared paper, as in Bain's early form of T. The introduction of *duplex* telegraphy, by which messages can be sent in both directions simultaneously through the same wire, has greatly increased the transmitting power of telegraphic lines. The method by which this is most easily effected is by splitting up the current at the sending station into two portions, which affect the needle in opposite directions, and only one of which is transmitted along the line to the receiving end, the other being taken directly to earth. The current, then, which acts upon the needle at the receiving end has no effect at all upon the needle at the sending end, which is thus free to be acted upon by a simultaneous current which, split up similarly and unaffecting its needle, is transmitted from the other end. In 1874 Edison invented a method of sending two messages in the *same* direction simultaneously, so that quadruplex telegraphy is now an accomplished fact. Elisha Gray of Chicago has succeeded in sending as many as eight messages along a wire at once by introducing the currents into the circuit through vibrating reeds tuned to different pitch. At the receiving end are exactly similar and similarly-tuned reeds, each of which picks out its own current, vibrating only when a current has entered at the sending station through its corresponding reed. This ingenious method evidently admits of great development.

Submarine T.—On land the wires are usually stretched on insulating supports fixed upon tall poles, and are uncovered by insulating material, the atmosphere being a sufficiently good insulator to prevent rapid leaking. When, however, schemes were suggested for carrying lines under rivers, lakes, or seas, it was found necessary to cover the wire with an insulating material, the most convenient one being indiarubber or gutta-percha. One of the greatest scientific triumphs of the present century was laying a telegraphic cable across the Atlantic so as to bind Europe and America together in close communication. When a signal is sent through such a cable, a measurable in-

terval of time elapses before it produces any effect on the distant end; and, further, when this effect at length appears, it is found to grow gradually to a maximum. The maximum effect occurs at the receiving end of an Atlantic cable about three seconds after the signal is sent from the sending end. After the signal is sent, the sending end is put to earth, and the cable allowed to empty itself, in doing which the current falls off to a minimum according to exactly the same law by which it formerly attained its maximum. There is thus a limit to the speed of signalling in such cables. Further, the leakage is so great for a long cable that the ordinary modes of registering fail, and other more delicate methods must be supplied. The practical realisation of this department of telegraphy is due more to Sir W. Thomson and C. F. Varley than to any other electrician that could be named. The delicate recorders invented by the former are now at use at all cable stations, and these merit a few words of explanation. The mirror galvanometer (see ELECTRICITY), now an indispensable instrument in every physical laboratory, was constructed at first solely for cable use. The delicately-poised mirror, backed by minute magnets, answered at once to the weakened cable current, and from its right and left deflections, indicated by a beam of light reflected upon a screen, gave the message made up according to the Morse alphabet code. Far more delicate, however, is Thomson's siphon recorder, which records the right and left deflections by means of a jet of ink spurted from a fine glass siphon attached to a light coil which, suspended between the poles of a powerful electro-magnet, swings to one or other side according to the direction of the feeble cable current which is passed through it. The ink is ejected only when electrified, and is received upon a passing strip of paper. When no message is being sent, the record appears upon the paper as a straight line; but when the interrupted currents pass through the coil, the record appears as a wavy line —waves to the right representing the *dot*, waves to the left the *dash*. A full description of the most recent improvements will be found in a pamphlet by J. A. Ewing (1876), in which also the *automatic curb sender* of Thomson and Jenkin is described for the first time. The principle of this latter instrument is to send into the cable a second reversed current, which, by neutralising the bad effects resulting from the gradual diminution of the first charge, brings the siphon quickly back to zero, and increases the speed of signalling.

According to the latest returns for the various countries of the world, published in the *Almanac de Gotha* for 1879, the total length of telegraphic lines over the globe is 431,761 miles, divided amongst the several continents as follows:—Africa, 7999 miles; America, 127,980 miles; Asia, 24,760 miles; Australasia, 36,692 miles; Europe, 234,330 miles. The total length of wireage may be estimated at about three times this length; and most of these lines are in the hands of the Governments of the different countries. The total mileage of telegraphic cable is estimated at 230,089 miles.

There is now an extensive literature on the subject, including the bi-monthly *Telegraphic Journal* (Lond.), the weekly *Telegrapher* (New York), and the bi-monthly *Annales Télégraphiques* (Par.). See also *History and Progress of the Electric T.*, by R. Sabine (2d ed. Lond. and New York 1869), *Telegraphy* by W. H. Preece and J. Sivewright (Lond. 1876), *History, Theory, and Practice of the Electric T.* (Boston 1865), and *Electricity and the Electric T.* (New York 1877), both by G. B. Prescott, *Handbuch der Elektrischen Telegraphie*, by E. K. Zetzsche (Berl. 1876), *Traité de Télégraphie Electrique*, by Du Moncel (Par. 1864), and *Les Systèmes Télégraphiques*, by C. Bontemps (Par. 1876). The theoretical results of Sir W. Thomson are best studied in his own published papers or in Clerk Maxwell's *Electricity and Magnetism* (1873).

Tel'egu (said to be derived from Telinga = the three *lingas*, or emblems of Siva), a language belonging to the Dravidian (q. v.) branch of the Turanian family. It is chiefly spoken in the N.E. portion of the Madras Presidency, by an estimated pop. of 12,000,000.

Telem'achus, son of Ulysses and Penelope, was still a child when his father sailed for the Trojan War, but coming to man's estate, received from Athene counsel to wander forth and inquire Ulysses' fate. Disguised as Mentes or Mentor the Taphian king, the goddess herself guided him first to Nestor of Pylos, then to the Spartan Menelaus, and from the latter he learnt the Protean prophecy of his father's safe return. So hastening back to Ithaca, T. found Ulysses in the swineherd Eumaeus' hut, and aided him in the destruction of the suitors. Fénelon (q. v.) made his adventures the theme of a romance, which was once extremely popular, but which has very little merit.

Teleol'ogy (*telos*, 'an end') is a philosophical and theological term meaning the Science of the Ends for which things exist or were created. Like very many other terms in current use, it is derived, or at least first gets scientific meaning and precision in the system of Aristotle. According to that philosopher, the *telos*, or end of anything, is that for the sake of which it exists—it is at once cause and consummation. In modern times the argument that affirms design in nature—some divine plan 'to which the whole creation moves'—is called the teleological argument. Of this there are two phases which should be carefully distinguished: 1. The lower, which asserts that all the apparatus of nature were each definitely created for the end which it fulfils. To take a trite example, the camel was created to be of use to men so unfortunate as to dwell in a desert. But the obvious reply to this is that the same end might have been gained by the simple expedient of not creating the desert, 2. The higher, which asserts that a higher power may work towards a definite end by means of this and other natural laws. The great objection to this is the moral difficulty, *i.e.*, the relation between the good and the facts of existence; but here also the strongest support for it lies, for while the 'struggle for existence' does not seem to be arranged on purely moral grounds, yet it is in the facts of our moral life that the strongest presumption of an ultimate T. lies.

Teleosau'rus, a genus of fossil *Crocodilia* (q. v.), belonging to the section *Amphicœlia*, in which the bodies of the vertebræ were concave at either extremity, a conformation indicating their adaptation to an aquatic life. The hind limbs were well developed, the snout was prolonged after the fashion of the living Gavial (q. v.) of the Ganges, and teeth were numerous and slender. The remains of T. occur in Oolitic rocks.

Teleos'tei, a well-known order of fishes, including all familiar food-fishes, and such generally as have a well-developed bony skeleton. The T. include the Malacopteri (q. v.), Anacanthini, Acanthopterygii (q. v.), Lophobranchii (q. v.), Plectognathi (q. v.). *Fossil T.* are first found in the Cretaceous rocks, and exist in their maximum development in the oceans of to-day.

Tel'ephone (Gr. *tēle*, 'afar,' *phōnē*, 'sound') is any apparatus for transmitting sound beyond its natural limits of audibility. Thus, a stretched cord or wire may be used for carrying a whisper several hundreds of feet, and constitutes therefore a T. Of late, however, the word has been restricted to an instrument which can effect the same to a more wonderful extent, and that by electric means. In 1860 Reis invented an apparatus by means of which a musical note could be transmitted along a telegraphic line and heard easily at a distant station. At the one station a note was sounded close to a stretched membrane, which set into synchronous vibrations, completed and interrupted a circuit, through which consequently a discontinuous current flowed to the other station. Here it passed round a cylindrical coil, through the centre of which was drawn a thin iron rod, which was thus magnetised and demagnetised at every make and break of the circuit. Now such an iron rod when so treated gives a distinct click at every change of magnetic condition, the louder being when the circuit is made. Hence, if the making and breaking is sufficiently rapid, the corresponding clicks will combine to form a musical note, and this is precisely the action of Reis's T. In it, however, only the *pitch* of the note originally sounded is reproduced, and where the reproduction is effected by means of a *discontinuous* current we cannot hope for more than this, so that to reproduce a sound exactly as uttered is not possible upon the make-and-break principle. In 1876, however, Professor Graham Bell, a Scotchman resident in Boston, U.S., invented an *articulating* T., which depends upon the principle of the *undulating* current, and by means of which the very quality of a note, and therefore conversation itself, can be reproduced at a distant station. Bell was led to his discovery in his endeavours to discover an efficient means of multiplex telegraphy, and the essence of his first patent (February 14, 1876) is the employment of an undulating induced current produced by the oscillation of a magnetic diaphragm or tuning-fork in the vicinity of a coil of

wire. This oscillation may be produced by the human voice or by a musical instrument sounded near the diaphragm; and the undulating induced currents directed along a wire to the receiving end exactly undo what was done at the sending end—they set the diaphragm into oscillations which, transferred to the air, reproduce the original sound exactly as uttered. Such is the principle upon which the Bell T. works (see MAGNETISM). At the same time that Bell was developing his idea, Elisha Gray was working in the same direction, and in his patent of 1876 he indicated a method by which sounds might be accurately transmitted. His method depends upon a varying resistance, while Graham Bell's depends upon a varying electromotive force. The *practical* utilisation of a varying resistance is, however, really due to Edison, the inventor of the phonograph. His carbon T. utilises the property which carbon has of altering its resistance with pressure. The variation in pressure is produced by the sounds spoken to the one surface of the carbon, and the consequent variation in resistance is accompanied by a corresponding change in the intensity of the current which is directed through the carbon from a battery to the wire which leads to the distant station. There the undulating current is retransformed into the sound by means of an ordinary Bell magneto-electric T., which Edison claims to have first used as a receiver. For a detailed discussion of the claims of these gentlemen, see Prescott's *The Speaking T., Talking Phonograph, and other Novelties* (1878) and Du Moncel's *Le Téléphone, le Microphone, et le Phonograph* (1878). The microphone is an instrument by which sound is magnified, and was invented by Hughes in April of 1878. It depends upon considerable variations, produced by slight sounds, in the resistance of a circuit traversed by a current, the resulting changes in the intensity of the current being heard in a Bell T. which forms part of a circuit. The variations of resistance are produced by the variations in loose contacts at a certain part of a circuit—as, for instance, a few nails or pieces of carbon touching each other loosely. The most homely of microphones is no doubt the rough box of moistened cinders used by Blyth of Edinburgh (see *Transactions of the Royal Society of Edinburgh*, 1877-78). What the future of these instruments may be it is impossible to say, but it is within the limits of probability that a loud-speaking T., such as Edison's carbon instrument, with a phonograph to record the messages sent, may ultimately supersede ordinary telegraphing by conventional codes.

Teleph'orus, a genus of *Pentamerous* beetles, including numerous British species. They have long narrow-shaped bodies. The larvæ are found in the earth, and the adults are insect-feeders.

Teler'peton, a curious extinct genus of *Reptilia*, the remains of which occur in certain sandstones of Triassic or Devonian age. T. remains have been found near Elgin in Scotland. These creatures had *acrodont* teeth—that is, teeth attached to the summit of the jawbones—and *amphicœlous* vertebræ, lizards having, as a rule, *procœlous* vertebræ. Professor Owen calls T. *Leptopleuron lacertinum*. There were twenty-six vertebræ between skull and sacrum, two sacral vertebræ, and thirteen caudal vertebræ. Impressions of twenty-one pieces of ribs are preserved.

Tel'escope (Gr. *tēle*, 'afar,' and *skopeō*, 'I see') is an instrument for viewing objects at a distance. All such instruments may be grouped in two classes, according as they are *refracting* or *reflecting* telescopes. In the former, the purpose is effected by a combination of optical lenses (see LENS); in the latter a curved reflecting surface or speculum takes the place of one or more of the lenses. The principle of the T. seems to have been known to Roger Bacon (*d.* 1292); and in 1570 Dr. Dee, in his preface to *Euclid's Elements*, suggests that a commander may reconnoitre a distant army by means of 'perspective glasses.' It was not, however, till about 1608 that the construction of the T. was effected; and three Dutchmen seem to have made the discovery independently about the same time, Lippersheim, Metius, and Jansen. Their claims are discussed by Humboldt in his *Cosmos* (vol. ii.). When the news of the discovery reached Italy, Galileo at once saw what the essential conditions of such an instrument must be, and setting to work soon completed a T. for his own use. It consisted of two lenses, a double-convex object-glass, and a double concave eye-glass of much shorter focus. The converging rays from the object-glass are received before they meet at the focus by the concave lens, which is set so as to make the rays continue in parallel lines. With such an instrument Galileo made all his great astronomical discoveries. Instead of the concave lens, a convex lens may be used as an eye-glass, if it is set on the *further* side of the focus, so as to reduce the now diverging rays to parallelness. This form of T. was described by Kepler, and first constructed by Scheiner in 1650. Its disadvantages as compared with the Galilean T. are that it is not so compact, and that the image is inverted and not so clear. It possesses certain advantages over the latter, however, such as offering a larger field of view and being more effectual in very faint light, advantages which have established it as the *astronomical T.* The Galilean T. is familiar in the binocular opera-glasses. The magnifying power of a simple astronomical or Galilean T. is equal to the ratio of the focal lengths of the lenses, and is increased if the focal distance of the object-glass is increased, or if that of the eye-glass is diminished. There is of course a practical limit to the latter operation; so that astronomers, in their attempts to increase the magnifying power of their telescopes, had to make the object-glass with as long a focal length as possible. Thus in 1672 Campani constructed one 136 feet long, Auzont used one of 600 feet (a tube in such a case was out of the question), while Huyghens' 123 feet long T. is still preserved by the Royal Society of London. Huyghens showed how to increase the distinctness of such a T. by using a particular form of eye-piece, hence called Huyghens' eye-piece. There were, however, defects in the object-glass which Huyghens was unable to eradicate—namely, spherical and chromatic aberration (see ABERRATION). Newton succeeded in eliminating the former by making the lens a particular form, but its elimination only brought into more prominent view the latter and worse defect. Since each lens acts as a prism to the rays passing through it, the image becomes fringed with colours, a defect very observable in long focussed lenses. This is a necessary consequence of the different refrangibilities of the different coloured rays of light, so that the focus, instead of being a single bright spot, is drawn out into a chromatic line with the violet end nearest the lens. The length of this focal line is called the dispersion, and from one experiment Newton hastily concluded that the dispersion was proportional to the deviation, and that therefore dispersion must always accompany refraction. This conclusion was subsequently disproved by Dollond, who showed that dispersive powers differed widely for different substances. Thus the dispersive powers of *crown* and *flint* glass are as 3:4, so that by combining a convex lens of the former of 3 feet focal distance, with a concave lens of the latter of 4 feet focal distance, the dispersion is reduced to zero, while the focal distance of the compound lens is 12 feet. In this way Dollond practically solved the problem of the achromatic telescope. All good refracting telescopes are made with achromatic object-glasses. For ordinary terrestrial purposes, two lenses, at least, must be added to the eye-piece, one to reinvert the inverted image formed in the usual way, the other to view this second image. Thus a direct image is obtained. Dollond's four-glass eye-piece combines this reinverting principle with the principle of the Huyghenian eye-piece.

When Newton, from his having accidentally experimented with two substances of the same dispersive power, failed in eliminating chromatic aberration, he turned his attention to the construction of the reflecting T.; and to him is due the honour of having first constructed a reflecting T., a form of which had already been proposed by Gregory. Instead of the convex object lens of the refractory T. a concave reflector is substituted; and since all rays of light obey the same law of reflection, there is no chromatic aberration. For spherical reflectors, however, spherical aberration exists as in ordinary lenses; and to eliminate this defect for parallel rays the surface should be made a paraboloid of revolution. Three modifications of the reflecting T. exist, namely, the Newtonian, Gregorian, and Cassegrainian. The Newtonian reflector (1666) is the simplest in construction. The reflected rays are received on an inclined-plane mirror before they come to a focus, and are reflected to the side of the tube where the focussed image is viewed by an eye-piece as in the ordinary refracting T. In Herschel's great reflector of 4 feet diameter and 40 feet focal distance (erected 1787, dismantled 1822), there was no second reflector. The great reflector was slightly inclined so as to throw the image to the side of the tube

where it was viewed directly by means of the eye-piece. This modification is sometimes distinguished as the Herschellian T. In the Gregorian (1663), the concave mirror is perforated at the centre, and the reflected rays after meeting and diverging are received by a small concave mirror which directs them back through the central hole in the speculum, where they form a second image, which is then viewed by an ordinary eye-piece. The Cassegrainian (1672) differs from this only in having instead of a small concave mirror a small convex mirror, which is set so as to receive the rays from the great reflector before they meet. Reflectors are usually constructed upon the Newtonian principle, and of these the largest in existence is Lord Rosse's T., erected at Parsonstown, Ireland, in 1842. The speculum, an alloy of copper and tin, is 6 feet in diameter, with a focal length of 55 feet. The Melbourne reflector (1868) is a Cassegrainian reflector. Its speculum (also of copper and tin) is 4 feet in diameter and 30 feet 6 inches focal length. Specula are now made of silvered glass—a form first suggested by Foucault. The largest silvered-glass reflector, that in the Paris Observatory, is 47½ inches in diameter and 23 feet in focal distance, and was the work of Martin and Eichens. Lord Rosse's, at Birr Castle, constructed by himself, has an aperture of 36 inches. The construction of a speculum, 7 or 8 feet in diameter, has been undertaken by Grubb for a Californian observatory]; but the difficulty of polishing and firmly fixing such large surfaces is extremely great. An achromatic lens of equal diameter would be far superior to the reflector, since there is less loss of light, but the difficulties attending the construction of even much smaller lenses are still insurmountable. The largest refractor in present use, the Washington equatorial, constructed by A. Clark & Sons in 1873, has a clear aperture of only 26 inches, and a focal length of 31 feet 6 inches. Newall's refractor, constructed by Cook & Sons, York, has an object-glass of 25 inches diameter and 29 feet focal length. Grubb of Dublin is constructing a 27-inch T. for the Austro-Hungarian Government, the focal length of which is to be 32 feet; and A. Clark & Sons are engaged on a 28-inch aperture T. for Yale College. See Lockyer's *Star-Gazing* (1878) for a description of the methods of construction.

Tel'ford, Thomas, a celebrated engineer, was the son of a Scotch shepherd, and was born at Westerkirk, Eskdale, Dumfriesshire, August 9, 1757. At the age of fourteen he was apprenticed to a stone-mason, and after spending two years in Edinburgh removed to London in 1782. Five years later he was employed by Sir William Pulteney to make some alterations on Shrewsbury Castle, whereupon he settled at Shrewsbury, and was soon after appointed county surveyor, in which capacity he superintended the construction of a considerable number of bridges. His first great work, however, was the Ellesmere Canal, 103 miles long, begun in 1795 and completed in 1805. The Caledonian Canal, opened 1823, was also constructed by him, as also the Glasgow, Paisley, and Ardrossan Canal, the Macclesfield Canal, the Birmingham and Liverpool Junction Canal, the completion of the Gloucester and Berkeley Canal, and the entire remodelling of the Birmingham Canal. For the construction of the Gotha Canal in Sweden he received a Swedish order of knighthood. As engineer to the Commissioners of Highland Roads and Bridges he introduced important improvements in roadmaking, and his system is most strikingly presented in the great highway from London to Holyhead, executed in 1815. The Menai Suspension Bridge (1819-26) and the St. Catherine Docks, London (1828), are monuments of his genius in design and his skill in execution. Among his bridges the most notable are the Broomielaw at Glasgow, the Dean at Edinburgh, the Conway in N. Wales, the Ober at Gloucester. T. contributed several valuable articles to Brewster's *Edinburgh Encyclopædia*, and was frequently consulted upon important schemes, not only by the British Government but also by foreign powers, especially Russia. He died September 2, 1834, and was buried in Westminster Abbey. See *The Life of T. T., Civil Engineer, written by Himself* (1838); also Smiles' *Lives of the Engineers* (new ed. 1875).

Tell, the strip of land in Algeria lying between the mountains and the sea. It has an average breadth of 47 miles, with an area of 5400 sq. miles. It is well watered and very fertile, producing cereals, beans, tobacco, cotton, and wine, has rich pastures and luxuriant forests of oak and cedar, and contains the principal cities of Algeria.

Tell, William, the national hero of Switzerland, according to popular belief, was a native of the canton of Uri, who flourished about the beginning of the 14th c., with a great local reputation as a crossbow-man. Refusing to uncover his head before the ducal hat of Austria erected on a pole in the market, place at Altorf, he was dragged before the bailiff Gessler and ordered, on pain of death, to shoot an apple from his son's head. He performed the feat successfully, but having by a bold answer still further enraged Gessler, he was seized, bound, and thrown into a boat on the Lake of Lucerne in order to be taken to the castle of Küssnacht. A storm having arisen, T. was released and permitted to take the helm, but he ran the boat to a rocky ledge, from which he suddenly sprang ashore and escaped. He now lay in wait and shot the bailiff through the heart as he passed on the road between Arth and Küssnacht. Tradition tells nothing further of T. than that he was drowned in 1350 in the river Schlächen. Of the story of T. there is no mention in the four extant chronicles written in the first half of the 14th c., nor until 1470, the date of the *Weisse Buch*, which was discovered in the monastery at Sarnen. The story here differs in essential respects from the later form of the legend, and illustrates the manner of its growth. The name Wilhelm Tell appears for the first time in the *Tellenlied*, a ballad of 1470, which is alluded to in the chronicle of Melchior Russ, town-clerk of Lucerne, written in 1480. In 1507 appeared the chronicle of Petermann Etterlin, in which the story is given verbatim from the *Weisse Buch*, showing that that chronicle, though unpublished, had not remained unread. In 1515 a Latin poem was published on T. by a native of Glarus, and in 1540 appeared a play entitled *Ein hübsch spyl gehalten zu Ury in der Eydgnossnschafft von dem Wilhelm Thellen ihrem landtmann und ersten eydtgenossen*. In 1546 the story is given by Johann Stumpff in his *Chronick*, but it took its present form in the hands of the famous Ægidius Tschudi of Glarus in his *Chronicon Helveticum*, and received its final embellishment from the patriotic historian Johannes von Müller. The earliest expression of a doubt of the historical character of the story was given in 1607 by Willimann in a letter to his friend Goldast (published 1688). In 1754 Voltaire pointed out its suspicious character in his *Annales de l'Empire*, and in 1760 appeared a pamphlet with the title *Guillaume T., fable danoise*, by the Pastor Freudenberger, in which it is pointed out that a similar story is told of Toko or Tokko, and Harold, son of Gormson, King of Denmark, by Saxo Grammaticus, who flourished during the 12th c. The story, however, is also given in the *Vilkinasaga*, which appeared in the 13th c., and in which the actors are the archer Eigil or Ægel and King Nidung, as well as in our own 'north country' ballad, *Adam Bell, Clym of the Clough*, and *William of Cloudesley*, which is printed in Percy's *Reliques*. The story of the 'master-shot,' however, is not the common property alone of the Aryan races, but is, says Dr. Dasent, 'common to the Turks and Mongolians, while a legend of the wild Samoyeds, who never heard of T. or saw a book in their lives, relates it chapter and verse of one of their famous marksmen.' Swiss patriotism took umbrage at this attempt to deprive their country of its popular hero, but was singularly unfortunate in its attempts to establish his existence. The anonymous pamphlet of Freudenberger was burned by the public hangman at Uri, while a reply appeared written by the Vicar Imhoff, in which an account of T. is given, as is alleged, from an old manuscript, but which is a mere repetition of the version of Etterlin and Tschudi, while statements are quoted from spurious documents, and full belief is attached 'to the testimony, apparently dated 1460, in which one Johann von Brunnen alleges that he had found in an old paper the statement that the chapel built on the spot of T.'s leap, on the Lake of Uri, was erected by virtue of a decree issued by the Landesgemeinde, held in 1388, where there were present upwards of 114 persons who had known T.' Misguided patriotism, however, went farther than giving easy belief to vague assertions, as was discovered by Professor Kopp, for in the parochial register of Schladdorf, the name Walter von Trullo was altered into Walter von Tello, Näll was changed three times into Täll, while a document was forged purporting to contain a decree of the Landesgemeinde at Altorf, issued on Sunday, May 7, 1387, ordering a sermon to be preached yearly at the house of T., 'the first founder of their liberty.' The *Apfelschuss* of the Swiss archer must be laid aside as having any claim to be considered as a genuine historical fact,

but it has been for ever enshrined in the noble drama of Schiller. See Dr. Ideler, *Die Sage von dem Schusz des T.* (Berl. 1826); Dr. Huber, *Die Waldstätte bis zur Begründung ihrer Eidgenossenschaft* (Innsbr. 1861); Dr. W. Vischer, *Die Sage von der Befreiung der Waldstatte* (Leips. 1867); and M. Albert Rilliet, *Les Origines de la Confédération Suisse, Histoire et Légende* (Gen. 1868, 2d ed. 1869), the most exhaustive work on the subject. See also the *Edinburgh Review* for January 1869, the Introductory Essay to Dr. Dasent's *Popular Tales from the Norse* (new ed. Lond. 1864), and the introduction to Professor Buchheim's edition of Schiller's *Wilhelm T.* (Oxf. Clar. Press, 1871).

Tellez', Ga'briel, or **Tir'so de Moli'na** (to give him his more illustrious pseudonym), was born at Madrid in 1585, and in 1613 took the monastic vows, becoming Prior of Soria (1643), where he died in 1648. Author of some 300 comedies, this clerkly playwright is known to us now by but 68; these are enough, however, to show his original and many-sided genius, his bold invention, and his masterly analysis of character. In the *Burlador de Sevilla* he created the first 'Don Juan;' little inferior are his *Don Gil de las calzas verdes, El Amor Médico*, or *Marta la piadosa*. T. further wrote novels, and, more in accordance with his sacred calling, some *autos sacramentales* and other religious plays, these under his proper name. The best edition of his works is that by Hartzenbusch (12 vols. Mad. 1839-42; 2d ed. 1850).

Tell'icherry, a town in the district of Malabar, Madras Presidency, British India, 325 miles E.S.E. of Madras, and 64 N. from the railway terminus at Beypore. An English factory was established here as early as 1708. T. is celebrated for an unsuccessful siege (1779-82) by the troops of Hyder Ali. It is now an active seaport, chiefly for the export of coffee, sandalwood, and cardamoms from the Wynaud, and the import of rice. In 1874-75 the exports were valued at £483,000; the imports at £504,000. Pop. (1871) 20,504.

Tell'ing For'tunes. See FORTUNE-TELLING, CHEIROMANCY, &c.

Tellin'idæ, a family of *Lamellibranchiate* mollusca, belonging to the section of that class in which large respiratory *siphons* are developed. They have an equivalve shell, with the ligament on the thickest side of the shell. The mantle is widely open in front, and the siphons are long, slender, and separate.

Tellu'rium (Te = 129), an element sometimes classed as a metal, but more closely resembling selenium and sulphur in its chemical properties. It is obtained chiefly from Transylvania, where it is found in a certain gold ore associated with selenium. It has been found native, but usually occurs as a telluride of a metal, as in *graphic T.*, a black mineral containing tellurides of lead, silver, and gold. T. has a pinkish metallic lustre, is crystalline and brittle, fuses below a red heat, and volatilises into a yellow vapour at a high temperature. It burns in air with a green and blue flame, emitting fumes of tellurous acid (TeO_2), which is a feeble acid, but acts as a base with some of the stronger acids, forming a sulphate ($Te(SO_4)_2$) and nitrate ($Te(NO_3)_4$). Telluric acid (TeO_3), corresponding in composition to sulphuric acid, is also a weak acid, forming unstable tellurates, which are converted into the tellurites when heated. T. forms two solid chlorides, $TeCl_2$ and $TeCl_4$, the former of which, the *tellurous* chloride, is decomposed by water into T. and the *telluric* chloride. Telluretted hydrogen (H_2Te) closely resembles sulphuretted hydrogen in smell and other properties, precipitating tellurides when passed into solutions of metallic salts.

Tembu', Amatembu', or, more generally, **Tambu'kies**, a leading tribe in Kaffraria, said to be the oldest branch of the Kaffir race. Their territory, which lies at the head-waters of the Kei, Bashee, Tsomo, and other streams, has an area of about 4325 sq. miles, and is a plateau of moderate elevation, well watered and grassed, and fairly wooded. After the war of 1851, when their power was shattered, the T. remained quiet and friendly until 1878, when a section of them rebelled. They have large flocks and herds, and raise wheat, oats, and Kaffir corn in considerable quantities. Missionaries have met with much success among them. In 1876 the district was virtually annexed to Cape Colony, whose government is represented by a resident agent. Pop. about 80,000.

Temesvar', a town of Hungary, on the river Temes, 187½ miles S.E. of Pesth by rail, and 118½ N.W. of Orsova by a line opened in June 1878. The inner town is parted from four suburbs by a broad *glacis*, partly converted into pleasure-grounds, and the buildings include a Roman Catholic and a Greek cathedral, a splendid synagogue, the castle, built by Hunyades in 1443, and now a house of correction, two seminaries, and a theatre. There are manufactures of cloth, silk, leather, &c., and a lively trade in colonial wares. Pop. (1870) 32,223. T. was seized by the Turks (1552), but recaptured by Prince Eugene (1716), and in 1849 was vainly besieged by the insurgent Magyars for fifteen weeks.

Tem'pe, a narrow valley of north-eastern Thessaly, 4½ miles long, which, set between Ossa and Olympus, follows the windings of the river Peneus. The scenery, uniting soft beauty with rugged grandeur, was celebrated by many of the classic poets, who speak of T. as one of Apollo's favourite haunts.

Tem'perament (Lat. *temperamentum*), in music, the division of the octave into a number of intervals suited for musical purposes, to secure which the notes in certain instruments, such as the piano and organ, require to be regulated and adjusted. In the theory of harmonies the interval of a tone is not always the same, that lying between the fourth and fifth of the scale, for example, containing nine small differences or commas, whereas the interval between the fifth and sixth contains only eight commas. The diatonic semitone, again, contains five commas, and the chromatic semitone a smaller number, according to the magnitude of the tone. To improve the relations of these intervals by a sort of compromise is the work of T., which entails practically a new division of the octave. On the pianoforte, which is tuned by equal T., there are twelve equal intervals or semitones in the octave. The difference which exists in theory between two such notes as C♯ and D♭ is no longer recognised, one note doing for both. The consequence of this is that all the intervals are mathematically slightly incorrect, but that the errors are less noticeable than if some of the intervals had been made perfect at the expense of others. This latter system of unequal T. was formerly usual on the organ. One or two notes in the scale were absolutely correct, and the whole burden of the T. was placed upon the remainder. The keys in common use worked well, but those with more than three sharps or flats were so harsh and out of tune as to be almost unbearable. By the system of equal T. the individuality of the different keys is to a great extent lost, indeed it would vanish altogether if the T. were absolutely equal. As it is, some slight shades of inequality are allowable. No fifths on the pianoforte or organ are perfect, although in theory they are supposed to be so.

The necessity for temperament arises on account of the imperfection of instruments. No instrument has ever been constructed capable of producing such absolute correctness of tone as the human voice, although stringed are much more accurate than keyed instruments. A singer or violinist with a finely correct ear and intonation will, if left to himself, and if not misguided by a tempered instrument, produce his notes in true relation to each other throughout the most intricate modulations. A habit of mal-intonation in singing is, on the other hand, acquired by learning singing with a pianoforte accompaniment.

One of the earliest writers on T. was Mersenne, who in his *Harmonie Universelle*, published in 1636, divided the octave into fifty-three equal parts. See Woolhouse's *Essay on Musical Intervals* (1835), and article by R. H. M. Bosanquet in Stainer and Barrett's *Dictionary of Musical Terms* (1876).

Tem'perance Movement. The 'Temperance Cause,' so recent in its birth, so rapid in its growth, may fairly claim to be regarded as a typical agency of modern times. With its noble aim—the preservation of the frail and the reduction of human misery—it is a manifestation of active Christianity, equalled perhaps only by the modern extension in the operations of charity. It has an organisation at once concentrated and far-reaching. Vigour and ability are shown in the management of its large corporate bodies and in the enterprise and ceaseless activity of its propaganda. To the support of the educated and the highly stationed it now adds the general sanction of society; it has survived the bitterest attacks of logic and ridicule, and can now count its membership by millions.

Temperance Arguments.—The question of abstinence from intoxicating liquors is of special interest in its physiological and social phases. (1) *Physiological.* That much indulgence in alcoholic drinks causes great injury to the health is now almost as widely admitted as that total abstinence under certain peculiar circumstances is injurious (see INTEMPERANCE). The real point in dispute is whether the regular consumption of a small amount of alcohol by persons of ordinary constitutions and in tolerably good health is beneficial or the reverse. Starting with the assertion that alcohol is not a direct product of nature, the teetotaller argues that by its interfering with the oxygenation of the body's tissues it vitiates the blood and lowers vitality. This, to some extent, is generally admitted, but recent experiment shows that alcohol to the extent of 1½ oz. acts as a highly nutritious food which is easily digested and rapid of production. Professor Hammond, a recent American authority, by experiments upon himself, found that under certain conditions alcohol increases the weight of the body, and maintains the system in a normal state, notwithstanding a diminished dietary. Its effects when taken *plus* sufficient food were, however, disturbance of general health, increased circulation, variable appetite, and physical and mental lassitude. Professor Fraser of Edinburgh University, in a lecture delivered 17th January 1879, says that 1½ oz. of alcohol are equivalent to a fourth part of food in an ordinary mixed diet. Again, the abstainer contends that while alcohol gives a certain stimulus to the nervous system, such stimulus is necessarily followed by relapse, and in order to keep up the stimulus there must be a constant increase in the 'dose.' The answer of the physiologists is that the so-called reaction is not greater than when the effect of ordinary food is exhausted, and against the idea that stimulation requires a regular increase of stimulant, that moderate drinking inevitably tends to excess, an appeal lies to the general experience of civilised society. After arguing that alcohol is a sedative, Dr. Wilkes says its effects on a healthy man would be 'the diminution of the energising wear of the nervous system, especially that employed in emotion and sensation.' In the same strain Dr. T. K. Chambers: 'Alcohol calmly arrests the energies of the nervous system which would fret the tissues to decay. . . . . Now, with years the replacement by nutrition of the tissues is much diminished' (*Diet in Health and Disease*). Sir W. Gull, in evidence given before the Lords' Committee on Intemperance (1878), says he regards it as unnecessary for the young, but 'must consider alcohol in respect of age and climate.' While admitting that out-door workers may take beer beneficially, he denies that intellectual work can be done better with alcohol than without it. Sir James Paget, the distinguished surgeon, thus sums up his unusually long experience: 'My study makes me as sure as I ever would venture to be of any such question, that there is not yet any evidence nearly sufficient to make it probable that a moderate use of alcoholic drinks is generally, or even to many persons, injurious, and that there are sufficient reasons for believing that such a moderate use is on the whole generally beneficial.' This view is supported by Dr. Moxon and Dr. Albert Bernays. On the other hand, Dr. Lauder Brunton, though not objecting to alcohol for those who are past middle age, thinks that a healthy man, eating and sleeping well, is as a rule better without it; while Dr. Murchison, who is more decided, says, 'Its occasional use will do him no harm; its habitual use, even in moderation, may and often does induce disease gradually.' Dr. Radcliffe, a very great authority on nervous diseases, holds that 'as yet there are no trustworthy statistics to show that abstinence is attended with unusual length of life or improvement in health,' while he lays it down as an absolute axiom that 'the majority of adults can take alcohol in some form or other not only with impunity but often with advantage.' The scientific experiments of the late Dr. Anstie and of Dr. Dupré proved that 1½ oz. of absolute alcohol was 'the limit to the food use of that substance in 24 or it may be even 12 hours.' This quantity corresponds, according to Dr. Kidd, to nearly six tablespoonfuls of brandy, to four small glasses of port or sherry, or nearly twice as much of claret, hock, or chablis. Dr. Garrod would allow 'half a bottle of claret' in 24 hours; and there would be about the same amount of alcohol in half an imperial pint of Champagne or Burgundy, in a quarter of a pint of port, sherry, or Madeira, and in three-quarters of a pint of pale ale or stout. Moderation, as defined by the doctors, absolutely forbids the use of alcohol beyond 'the first stage of its action—the quickened state of the nervous system, the livelier mental expression, the gentle warmth of the extremities.' Thus, though the majority of the above opinions (mostly culled from the Symposia in the *Contemporary Review*, Nov. and Dec. 1878) are favourable to temperance as opposed to abstinence, they hold forth not the slightest excuse for indulgence. It would be easier, indeed, for most men to forego alcohol entirely than to restrict themselves to such a modicum as temperance thus defined would allow. Science, at least, seems to condemn what has long been regarded as moderation as in reality excess.—(2) *Social.* The social pleas and counter-pleas, which trench on the one hand on morals, and on the other on politics, may be summarised more briefly. It is urged primarily that drinking is the great cause of all the evils to which the poorer classes are heir. It saps the strength of the artisan or labourer, converts his home into a den of misery, and draws him irresistibly into the current of pauperism and crime. The drunkard is the ready victim of disaster, and retaliates on society in the foulest deeds of violence. His existence imposes on a nation the burden of maintaining a greatly extended system of poorhouses, lunatic asylums, prisons, and police. Not only is his productive labour lost to the nation, which is taxed by the support of such institutions, but his large expenditure on drink places a premium on a business which is an economic anachronism, withdrawing labour as it does from vastly more productive industries, while it occupies 69,000 acres of English soil with hops, and diverts 12,000,000 bushels of the grain supply from its legitimate use, and so increases the price of bread. In 1878 the cost of spirituous liquors consumed in the United Kingdom was estimated at £149,772,610, and, according to Professor Leoni Levi, the working classes contribute, out of every pound paid in taxes to the national exchequer, as much as 13s. 5d. on liquors, as against 3s. 4d. contributed by the middle and upper classes. Nor does this adequately represent the expenditure which the habit of drinking brings upon the class that mainly supports the money-lender, the 'club-man,' and the pawnbroker. Addicted to a costly vice, which rapidly drains their slender means, the poor are notoriously cheated in the quality of liquors by the very publicans they befriend, and are provided with every facility for ruin by easy access to a false system of credit. Regarding the 'drink-curse' as the chief if not the only cause of misery and crime, the abstinence advocate demands the support of those to whom abstinence may not appear a necessary measure of personal precaution: 'If you are fond of wine, you ought to abstain for your own sake; if not, you ought to abstain for the sake of others.' And not pausing at the advocacy of abstinence as a duty to country and humanity, the majority of abstainers look upon legislative restriction as the only proper logical expression of their doctrines. The ordinary counter-pleas are that 'you cannot make people sober by Act of Parliament,' and that it is a fiscal as well as an economic error to regard as lost the large sum expended on Exchequer duties and on the liquor-trade. The misery of the lower classes, it is said, is not due to, but is only augmented by drinking, and any permanent improvement in their condition could only be effected by material and moral reforms. It is affirmed that destitution following a reduction of wages contributes more decidedly than drunkenness to an increase of crime. A prohibitory law would be an unjustifiable interference with liberty, likely to evoke chronic evasion, and certain to produce perpetual strife. It would defeat its own purpose, for abstinence to be valuable must be the result of moral conviction, and men compulsorily deprived of drink would fly to opium or other narcotics. Educate the people, say the opponents of permissive legislation—give them just moral and religious views, substitute for frothy declamation the earnest teaching of science, and the result will be a revolution greater than that which has been effected among the refined and the wealthy.

Legislation.—Accepting the dictum of J. S. Mill, that the liberty of one man ends where it becomes fatal and ruinous to another, the abstainer, with Archbishop Whately, would gladly curtail his liberty if thereby he could restrain another's licence. The legislature admits the exceptionally dangerous nature of the liquor-trade by placing it under strict limitations, why then not suppress it entirely? The amount of drinking is in direct proportion to the number of public-houses, therefore by reducing their number you will diminish intemperance. In the state of Maine, U.S., the liquor traffic was suppressed in 1846, although all

attempts have as yet failed to introduce a similar law in several other states. In Scotland a Sunday-closing law came into operation in 1854, and in Sweden a law (1855) imposing a tax on public-houses proportionate to the amount of spirits sold. Under the Gothenburg license system a responsible commercial company assumes entire control of the liquor trade, paying over to the town treasurer all profits on the drink sold, and these amounted to £35,000 in 1875. This system is only restrictive in so far as the trade is placed under the control of those who are in no way interested in its extension. A local prohibitory or Permissive Act was passed in Canada in 1878, and may be adopted in any county or city on a vote of 25 per cent. of the electors. The British Permissive Bill is designed to enable two-thirds of the ratepayers of a municipal borough or parish to suppress the public-houses within their bounds. It was defeated in 1878 by 288 to 86 votes. The Sunday Closing Act for Ireland (1878) met with determined opposition in the Commons, and was modified so as to exempt Dublin, Cork, Belfast, Limerick, and Waterford from the provisions of early closing. Sir Wilfrid Lawson has intimated (January 1879) that in place of his Permissive Bill he intends to move a resolution that the House gives its opinion in favour of entrusting to the inhabitants of a locality the power of restraining the issue and renewal of licences. The Right Hon. W. E. Forster, at Bradford (Feb. 1), volunteered his support to the modified measure, and his example, it is anticipated, will be followed by the party.

History of the Movement.—For the earliest beginnings as well as the greatest development of temperance organisation we must look to America. What is commonly regarded as the first temperance society was formed at Moreau, Saratoga county, New York, 13th April 1808, by Dr. B. J. Clarke, who expressed alarm at the progress of a vice that threatened to make America 'a nation of drunkards.' This society inflicted penalties of (1) 25 cents on any member who drank spirits or wine except in illness or 'at public dinners;' (2) 50 cents for being intoxicated; and (3) 25 cents for offering drink to others. Its influence was local, but it lived for fourteen years. Various societies, lay and clerical, were subsequently formed, but with little success, till the pamphlets of the Rev. Dr. Edwards arrested the attention of a wider public. On 13th February 1826 the American Temperance Society was organised at Boston, and the Rev. Dr. Hewitt made a series of powerful appeals on its behalf throughout the country. In the same year the *National Philanthropist* was started, and Dr. Lyman Beecher preached his famous 'Six Sermons.' At last fortune began to smile upon the cause, and by 1829 there were 1000 societies and 100,000 members. The same year saw the issue of the *Journal of Humanity*. The first National Temperance Convention was held in 1833, when a general union was formed, and it was reported that the societies numbered 5000, and the membership a million and a quarter. Under President Jackson a law was passed (1834) prohibiting the sale of liquor to the Indians, and in 1835 the Convention of Boston adopted the pledge of total abstinence from wine as well as spirits. Three years later the 'Fifteen-Gallon Law' was passed in Massachusetts prohibiting the sale of spirits in less than that quantity, and this was followed in 1839 by the 'One-Gallon Law' of Mississippi, and the 'Local Option Act' of Illinois. Subsequent restrictions were effected in Michigan, Ohio, &c., while the trade was completely ousted from Maine. The later organisations comprise the orders of Good Samaritans, Rechabites and Good Templars, the Sons of Temperance, &c. In America the cause is advocated in a specially aggressive spirit, and is made a political test by those who regard the licence system as an anomaly.

From America news of the movement early crossed the Atlantic, and in August 1829 a society was formed by the Rev. G. W. Carr at New Ross in Wexford, and another at Belfast by Dr. Edgar and others. Before a year had expired Ireland had 60 societies and 3500 members. In October 1829 the first Scottish society was organised at Greenock by Mr. John Dunlop, aided by Mr. William Collins, editor and publisher of *The Temperance Record* (1830-35). The Glasgow and West of Scotland Society, while forbidding ardent spirits, allowed the moderate use of other liquors. Its activity was remarkable, for by 1830 it had 5072 members in Glasgow alone, and had circulated 425,300 tracts and 20,250 pamphlets. A more stringent application of the temperance principle was introduced by Mr. John Davie, who in 1830 formed a society at Dunfermline pledged to abstinence from all liquors, 'small-beer excepted, and wine on sacramental occasions.' This was the precursor of the total abstinence societies which sprang up throughout the country. In England the movement, inaugurated by Mr. Henry Forbes at Bradford in February 1830, spread to Farrington in April, and to Manchester in May, and by the end of the year there were 30 societies with 10,000 members. The British and Foreign T. Society, formed in June 1831, was headed by the Bishop of London, and comprised several members of Parliament and various dignitaries. Its pledge was to abstain from distilled spirits and 'to discountenance the causes and practice of intemperance.' For many years as the leading society in England it represented the highest intelligence of the cause. At Preston in 1832 Mr. Joseph Livesey and others started the first English *teetotal* society. *Teetotal* is said to be a Lancashire accentuation of total; but its origin is also assigned to the climax of a stuttering philippic by one 'Dicky Turner,' when he declared, 'I'll be reet down tee-tee-total for ever and ever.' Founded in conformity with the stricter principle (1835), the British Teetotal T. Society was merged in 1836 in the New British and Foreign Society. The question of long and short pledges raised bitter discussion in England, but in the end the long pledge conquered everywhere. Meantime Father Mathew (q. v.) had enrolled in Ireland's Great National Total Abstinence Society as many as 1,800,000 members in two years. Among the various organisations that, with certain modifications of creed, carry on the T. crusade in Great Britain the chief are the British T. League, established 1835, with 1900 subscribers to the funds (organ, *British T. Advocate*); Western T. League, 1837, with 414 affiliated societies in 1878 (*The Herald*); National T. League, 1854, with an income (1878) of £4562, and branches on board 202 ships of the Royal Navy and in many regiments, its Indian Soldiers' Association having 9746 members (*Record* weekly, and *Medical Journal* quarterly); Midland League, 1856; North of England League, 1858, with 175 affiliated societies; Scottish League, 1844, with an income, 1878, of £7456, 10,569 members and 402 affiliated societies (*Journal* and *Adviser*); Glasgow Abstainers' Union, 1854; and United T. Association, 1873. There are several juvenile organisations, of which the chief is the United Kingdom Band of Hope Union, with 2305 unions in England, 98 in Scotland, and 133 in Ireland; its organ is the *Chronicle* (since 1877). This body held, in 1878, 2870 meetings, attended by 270,328 persons, and distributed 453,864 publications. Besides the influential Church of England T. Society, re-formed in 1874, there are distinct branches representing the Congregationalists, Methodists, Friends, and Roman Catholics. The principal political organisation is the United Kingdom Alliance, established in 1853, 'to procure the total and immediate legislative suppression of the traffic in intoxicating liquors as beverages.' The Independent Order of Good Templars (I.O.G.T.), the latest development of the cause, originated in New York in 1851, and reached England in 1868, Scotland in 1869, and Ireland in 1870. It is professedly a religious body, with an evangelical ritual, and takes its name from a fancied resemblance between its object and that of the Knights Templars, who warred with the Saracens in defence of the Holy Sepulchre. Making free use of social as well as strictly missionary means, it is characterised by the zeal of its members, the frequency of its meetings, as well as by a showy ceremonial, a lavish use of high-sounding titles, and a system of secret signs analogous to that of the Freemasons. The movement has spread with unprecedented rapidity, and already (1879) numbers in England and Wales 126,000 adults and 50,000 juveniles, and in Scotland 55,000 adults and 20,000 juveniles. In 1876 a split occurred between the American and European lodges on the question of the admission of coloured people, and the Order has since been divided into two nearly equal sections, the membership of both together amounting to some 700,000 adults. There are lodges in the African colonies, in Australia, India, and even in Japan and China. The organ in England is the *Watchword*. See the Rev. G. Gladstone's *Good Templarism* (Glasg. 1872), and the Hon. S. B. Chase's *Manual* (Edin. 1872).

A T. and General Life Assurance Co., London, founded in 1840, has issued 60,000 policies, and with an accumulated capital of £2,000,000, distributed a bonus of £348,458 in 1876. Its tables show a mortality in the five years 1871-75 of 723 among temperance and 1266 among general assurers. The London T. Hospital, founded in 1873, has been a singularly successful experiment in the non-alcoholic treatment of disease.

For information as to the whole T. M., see Graham's *Annual Guide* (Lond.), Evans' *Annual* (Lond.), *The Centennial Temperance Volume* (Philadel. 1877), the Evidence of the House of Lords' Committee on Intemperance (4 vols. 1878), and its Report, forthcoming; and Dr. Richardson's *Total Abstinence* (1879).

Tem'perature of a body is defined by Clerk Maxwell as 'its thermal state considered with reference to its power of communicating heat to other bodies.' If two bodies in thermal communication are observed the one to lose and the other to gain heat, the former is at a higher temperature than the latter; and if no such transfer of heat takes place the bodies are at the same T. The ordinary method for measuring T. is described under THERMOMETER. As a factor in meteorological phenomena, the careful measurement of T. is of the greatest importance; and the T. of any place depends first and foremost upon its position on the earth's surface relatively to the sun, which is our great storehouse of heat. The heat which is constantly being conducted from the earth's centre outwards and radiated from the earth's surface into surrounding space has little climatic influence except in limiting the minimum T. possible upon our globe in natural circumstances. The lowest natural T. ever observed was recorded by Hansteen in 55° N. lat., who observed it as low as 68°.3 C. below zero. Probably lower temperatures do exist in higher and unattainable latitudes; but at such low temperatures mercury freezes, and the spirit-of-wine thermometer is hardly trustworthy. The lowest artificial T. has been obtained by Cailletet when he solidified hydrogen by its own expansion (1878). To measure such a low T. is hopeless. The highest terrestrial T. with which we are acquainted is that of the electric light, which Becquerel estimates at 2070° C. Still higher is the T. of the sun, which, however, is probably far inferior to that of some of the brighter stars. Estimates of the T. of the space through which our system is passing have been made by Fourier, Pouillet, Hopkins, and others. The data, however, are insufficient, as proved by the discrepancy of their results; and not till we have measured the rate of radiation of the sun and planets, not to speak of other suns, can we hope to get even an approximation to the T. of space. The T. is probably very low, since there is evidence of very small absorptive power in circumplanetary space for radiant energy.

Tem'perature of the Body. The terms *cold-blooded* and *warm-blooded* animals serve roughly to indicate, the former, those animals which possess a temperature little raised above that of the surrounding medium; the latter, those with one considerably higher. Fishes, frogs, and reptiles are cold-blooded animals, whilst birds and quadrupeds are warm-blooded. Heat is produced through the combination of the oxygen of the atmosphere with the carbon and hydrogen of the blood and tissues. A much larger quantity of carbon and hydrogen is added to the blood from the food than the ordinary nutrition of the body demands; and the oxygen inhaled from the atmosphere, uniting with these elements, produces heat, carbonic acid, and water—the latter products representing the ashes of the bodily fire. Thus the temperature of the living body depends on chemical change. It is produced by the oxidation of combustible materials derived from the tissues and from the blood. The quantity of carbon and hydrogen which in any given period unite with oxygen in the body, may be accounted for by the quantity of heat generated in the same period. The temperature of an animal must thus be proportionate to its respiration, and to the activity and frequency of its breathing movements.

The circumstances which influence the temperature of the human body in health are very varied. The normal temperature of the internal parts varies from 98·5 to 99·5. The average temperature of the armpit is 98·6. In infant life the temperature is about 1° F. above that of the adult; and the temperature of old age resembles that of infancy. The temperature of the female slightly exceeds that of the male; and the temperature of the human body falls to its lowest level in the early morning. The *influence of disease* on temperature is very marked. In cases of fever and all diseases accompanied by increased oxidation of tissue and by abnormal tissue-waste, the temperature may rise to an almost unprecedented height. In typhus fever and pneumonia the temperature may rise to 106° F. or 107° F. Cases of malignant fever have been recorded in which the temperature of the armpit attained 111° F., and Wunderlich has placed a case of idiopathic tetanus on record in which the temperature was 112·5° F. at the time of death. On the side of *lowness* of temperature may be mentioned cases of *morbus cæruleus*, in which the blood is imperfectly ærated, when the temperature may sink to 77·5° F. In Asiatic cholera the mouth-temperature may be as low as 77° or 79° F., and Dr. Gee records a case of tubercular meningitis in which the temperature of the rectum remained for some hours at 79·4° F.

Tem'pering, in connection with metals, is a process similar to Annealing (q. v.), applied to metals and other substances. T. results in a molecular change in the structure of the body operated upon, and it is effected by a slow cooling of the substance from a heat varying according to the 'temper' desired (see STEEL). T. is a term almost exclusively employed in connection with iron and steel, cast iron being tempered in the same way as steel, and the production of what are now extensively used as 'malleable castings' being governed by a process partly of T. and partly of decarburation.

Tem'plars, Good. See TEMPERANCE MOVEMENT.

Tem'plars, Knights (*fratres milites templi*), one of the most remarkable of the orders of knights that flourished during the Middle Ages. Their origin is connected with the crusades. When a Christian kingdom was founded at Jerusalem, the enthusiasm of Western Christendom for the Holy Land reached its highest point, and crowds of pilgrims resorted thither. In 1119 several knights—of whom Hugo of Payens and Gottfried of Omer were the chief—formed themselves into a society to afford pilgrims help on their dangerous journey, and to keep the way clear of robbers and infidels. They received as dwelling a part of the Temple from Baldwin II., King of Jerusalem, and hence they were called poor knights, or brothers of the Temple. Their services were found of great value; they rose in the public estimation, and their number rapidly increased. At the Council of Troyes in 1128 Pope Honorius II. formally ratified the constitution of the order, confirmed Hugo of Payens in his post as grandmaster, and appointed as their distinguishing dress a white mantle, to which Eugenius III. added a simple red cross. The impression of their great seal was two knights on one horse, which signified either the original poverty of the order, or the mutual helpfulness of its members. In battle they displayed a black and white banner with the inscription 'Non nobis, Domine, non nobis, sed nomini tuo da gloriam.' After the council, Hugo with several companions travelled about on a recruiting expedition among the various courts of Europe. The grandmaster returned to the East with 300 knights, and this was only the beginning of a long course of prosperity and power, for the Templar was the embodiment of the two strongest desires of the Middle Ages —the desire for military renown and for a monk's life. The monk and the knight were the ideals of the period, and the Templar was both. As the order increased, the original and simple constitution drawn by Bernard of Clairvaux gradually became obsolete. Between 1247-66 the whole rules were revised and promulgated anew in an improved form. According to these, the K. T. consisted of three orders:—1. The knights, who were all of noble family. 2. The *fratres servientes* ('serving brothers'), who were from the citizen class, and were either (*a*) *armigeri*, or brothers-in-arms, who fought, voted, and were even eligible for some of the lower offices of the order; and the (*b*) *famuli*, or servants, who were craftsmen and performers of menial duties. 3. The *affiliati*, men in all conditions of life who attached themselves to the Templars in order to share their privileges. 4. A small number of dignified priests and chaplains who act as spiritual advisers to the order. The officers of the Templars were (1) the Grandmaster, who had the rank of a prince, (2) the Seneschal, (3) Marshal, (4) the Grand Preceptor, (5) the Draperer, (6) the Turkopolier, (7) the General Visitant. The affairs of the order in peace and war were divided among the officers, all of whom, except the last, were elected for life. The K. T. had numerous temporal and spiritual privileges, and in 150 years from their institution the order consisted of 20,000 knights, and had 9000 various kinds of possession in different parts of the East and West. When Jerusalem was retaken by the infidels they removed to Cyprus, and when this island also was lost they established their headquarters in France. But their wealth and luxury had raised up many enemies against them. Other orders were jealous of them, and the dignified clergy, with whose power their rights interfered, hated them. At last Philip II. of France, afraid of their power and

greedy of their wealth, resolved upon their suppression. He forced Clement IV., who then filled the Papal See, to assent to his plan, and on the 13th October 1306 all the K. T. who could be found in France were seized. It is unnecessary to detail the successive steps by which the order was fully suppressed; suffice it to say, that all the proceedings were characterised by the blackest injustice and the foulest cruelty, which may be said to have culminated in the murder of Jacques de Molay, the last grandmaster of the order, who perished at the stake, on an island in the Seine, 11th March 1314. The execution took place simply in virtue of the king's order, who was enraged that the grandmaster withdrew some false confession which the rack had extorted from him. The Knights of St. John obtained some of the property of the order, but the greater part fell to the share of the monarchs in whose kingdoms the Templars had flourished. See *Hist. Critique et Apologetique des Chevaliers de St. Jean de Jerusalem dits Templiers*, by Le R. P. M. J. (2 vols. Par. 1789); Wilcke, *Geschichte des Tempelherren-ordens* (2 vols. Leip. 1826-35; 2d ed. Halle, 1860); Haremann, *Gesch. des Ausgangs des Tempelherren-ordens* (Stuttg. 1846). In English, Addison's *Hist. of the Templars* (Lond. 1842); A. O. Haye's *Persecution of the Templars* (Edin. 1865).

Tem'plate, or **Tem'plet** (Lat. *templum*, 'a portion or piece cut off,' from Gr. *temno*, 'I cut'), a pattern in thin board or metal used by masons and bricklayers as a guide in forming ornaments, and by machinists, &c., in shaping teeth of wheels and other objects.

Tem'ple. The first T. at Jerusalem was erected by Solomon. His father David, who had intended building one, but had been prevented by the prophet Nathan (2 Sam. vii. 1-17; 1 Chron. xvii. 1-14, xxviii.), had still made certain preparations for the work by laying up treasure (2 Sam. viii. 7-12; *cf.* 1 Kings vii. 51) and collecting materials (1 Kings v.; 1 Chron. xxii.). The site was Mount Moriah (see JERUSALEM), the top of which, however, was insufficient, and had to be enlarged by masonry on the precipitous sides of the hill (Jos. *Bell. Jud.* v. 5). The building was begun four years after the death of David (about B.C. 1012; *cf.* 1 Kings vi. 1; 2 Chron. iii. 2). The stone and timber employed were brought from Phœnicia under a contract made by Solomon with Hiram, king of Tyre, who also supplied a large number of workmen for dressing the materials. The dimensions of the T. were exactly double those of the Tabernacle (q. v.), on the model of which it was constructed, with the exception of the height, which was 30 cubits, or three times that of the tabernacle. Only a third part of this would be the height of the sloping roof; at any rate, the inside of the holy of holies was a cube of 20 cubits (1 Kings vi. 20). The inside of the stone walls was lined with cedar-wood, which again was overlaid with gold. On the outside of the walls were a number of chambers, in three stories, which served as houses for the priests, magazines, bake-houses, and workshops (1 Kings vi. 5-10).

The first T. was destroyed by Nebuchadnezzar (B.C. 588), and a second was built on the same site by the Jews on their return from the Babylonian captivity (B.C. 536, Ezra i., vi.; begun 534, interrupted through the Samaritans till 520, and finished 516; Ezra v., vi. *cf.* Hagai i. 15). Pillaged and desecrated by Antiochus Epiphanes (B.C. 170), it afterwards became so desolate that it was overgrown with shrubs (1 Macc. iv. 38; 2 Macc. vi. 4); but it was purified and re-dedicated by Judas Maccabæus (B.C. 165). It was taken by Pompey, B.C. 63 (Jos. *Ant.* xiv. 4), and stormed and partially destroyed by Herod the Great, B.C. 37.

The third T. was that built by Herod, which was an entirely new structure, and the largest and most magnificent of the three (*cf.* Mark xiii. 1, 2). Begun about B.C. 20, the T. itself was finished in about a year and a half, and the outer buildings in eight years, although there were building operations carried on under Herod's successors (Jos. *Ant.* xv. 11; *Bell. Jud.* v. 5; *cf.* John ii. 20). This T. was completely destroyed at the capture of Jerusalem by the Romans, A.D. 70. A splendid mosque was built on the site by the Calif Omar after the conquest of Jerusalem by the Saracens (636). See Fergusson's *Temples of the Jews and other Buildings in the Haram Area at Jerusalem* (Lond. 1878).

Tem'ple. See INNS OF COURT.

Tem'ple, Frederick, born 30th November 1821, from Tiverton grammar-school gained a Balliol scholarship, and having taken a double first (1842), was elected fellow and mathematical tutor. Ordained in 1846, he became Principal of the Training College at Kneller Hall near Twickenham (1848-55), and head master of Rugby (1858-69). A Liberal in politics, a 'Broad Churchman' in theology, T. wrote one of the famous *Essays and Reviews* (1860), that on the 'Education of the World,' and his appointment to the see of Exeter in 1869 was met by strong though unavailing opposition. He has published *Sermons Preached in Rugby Chapel* (1858-60; new ed. Lond. 1867).

Tem'ple, Sir William, descendant of a Leicestershire family dating from the 13th c., proceeded from Eton to King's College, Cambridge, and early in Elizabeth's reign became master of Lincoln free school. A Latin essay (1581), dedicated to Sir Philip Sidney, brought him under the notice of that peerless knight, who made him his secretary, and dying in his arms at Arnheim, commended him to the Earl of Essex. Him T. followed to Ireland, where he rose to be provost of Trinity College, Dublin (1609), its representative in the Irish Parliament (1613), a knight and master in Chancery, and there he died in 1626.—His son, **Sir John**, born in London and bred in Dublin, was knighted (1640), under the Parliament became a commissioner in Munster, and after the Restoration a privy councillor, treasurer, and master of the rolls, and died in 1677. His *History of the Irish Rebellion* (1646, 3d ed. 1812) is truthful and scholarly, though written from an ultra-English point of view.—**Sir William T.**, son of the preceding, born in London in 1628, was educated at Penshurst, at Bishop Stortford, and under Cudworth at Emmanuel College, Cambridge. He then travelled in France, the Netherlands, and Germany, and marrying (1654), settled in Ireland. As member for Carlow (1661) he won the favour of Ormond, the lord-lieutenant, and introduced by him to Arlington, was sent to negotiate with the Bishop of Münster (1665). His success brought him a baronetcy and the post of resident at Brussels, and in 1668 he established his diplomatic fame by concluding with Holland and Sweden the celebrated Triple Alliance. At the Hague, where he now became ambassador, he made the friendship of De Witt and the Prince of Orange (whose marriage with Mary was T.'s work), and here he remained till 1670, when French and Cabal intrigues drove him from office. Withdrawing to Sheen, he gave himself up to gardening and writing his *Observations on the United Provinces* (1672), but in 1673 was summoned from his retreat to terminate the second Dutch war, resume his embassy, and carry through the negotiations that ended, but little to his liking, in the Peace of Nimeguen (1679). He shrank from the stormiest scenes of Charles's reign, refusing the proffered secretaryship of state, and on his scheme for a privy council falling through, abandoned politics for ever. At his Surrey seat, Moor Park, he passed his last years in epicurean ease, interrupted only by visits from William III. He died, January 27, 1699, leaving a younger brother, the father of the first Viscount Palmerston. Sir William's posthumous works were edited by Swift (q. v.), and a complete edition appeared at London (4 vols. 1814). See his Life by Courtenay (2 vols. 1836) and Macaulay's review of it, also Emmerton's *Sir W. T. und die Tripleallianz* (Berl. 1877).

Templemore' (Ir. Gael. 'the great temple' or 'church'), a town of Tipperary, Ireland, on the Suir, and a station on the Great Southern and Western Railway, 20 miles N. of Cashel and 80 from Dublin. T. has some trade in butter, cattle, &c. In the vicinity is the Priory, the mansion of Sir J. C. Carden, Bart., the beautiful grounds of which attract numerous visitors. Pop. (1871) 3443.

Tem'po, in music, the Italian word used to express time or the degree of rapidity at which a piece is to be played. The pace is usually indicated by certain words, such as *Grave* (very slow), *Lento* (slow), *Adagio* or *Largo* (leisurely), *Andante* (moving or walking pace), *Allegro* (gay or quick), *Presto* (rapid), *Prestissimo* (very rapid), &c. These terms are intensified by such words as *molto* (very), and modified by words like *non troppo* (not much). *Accelerando* denotes an increase of time, *Rallentando*, a slackening; *A Tempo*, a return to the original time. The exact length of each note may be still more precisely defined by a sign placed at the beginning of a work, such as ♩ = 124, which means that when the regulator of the metronome is placed at 124, each beat of the pendulum equals a crotchet, giving 124 crotchets to the minute. The word is most exten-

sively used in music, the following being a few examples:—*T. di ballo*, dance time; *T. di capella*, church-music time; *T. comodo*, easy time; *T. di marcia*, marching time; *T. primo*, first or original time; *T. reggiato*, time regulated to suit a solo performer; *T. rubato*, time varied for the sake of expression, what is taken from one note being given to another, or the pace being accelerated in one place and retarded in another; *T. di valse*, waltzing time.

Tena'city is the property which all bodies, but especially metals, possess of resisting a breaking stress. See COHESION and STRENGTH OF MATERIALS.

Tenaille', in fortification, is an outwork placed in front of the curtain, the postern and escarps of which it prevents being breached. See FORTIFICATION.

Ten'ancy at Will means that the tenancy is terminable at any time, by either party, under equitable circumstances. A tenant must be allowed reasonable time to remove, and to reap the fruits of crops which he has sown.

Ten'ancy in Common. See COMMON TENANCY.

Ten'ant for Life. The fruits of an estate may legally be given to any one, conditionally that the interest cease on the death of some one else; or, that on the grantee's own death the interest shall go to an individual, or in a manner specified. The immediate tenant is called in law a T. for L. Where no conditions as to the treatment of the subject are specified by the deed, the T. for L. will not be allowed to do any act tending materially to lessen its value or amenity. In Scotland a T. for L. is called a liferenter. See LIFERENT (q. v.).

Ten'ant in Fee Simple. See FEE SIMPLE.

Tenant-Right' is a term not unknown to English law, but has acquired prominence chiefly in connection with Ireland. According to the custom of Ulster, the tenant of a farm had (or claimed) a right of occupancy not subject to removal; fixity of rent; and also, in the event of his giving up his occupancy, a right to compensation for improvements effected. The origin of T.-R. is undoubtedly to be found in the old Celtic tenure of land, according to which ownership was vested not in the individual but in the tribe or clan. Practically throughout the North of Ireland this Ulster custom was conceded, though its non-recognition by the law was the cause of much angry and bitter disputation between landlords and tenants in individual cases. In other parts of Ireland, where the right had never been conceded by proprietors, the Celtic sentiment was equally strong; ejection from a holding was regarded as the worst of outrages, provoked the bitterest animosity, and was frequently followed by the assassination of the landlord or his agent. In 1870 the Gladstone ministry passed the 'Landlord and Tenant Act,' which gave to the Ulster custom and similar customs in Ireland the force of law, and where such did not exist made adequate provision for securing the rights of outgoing tenants. In Scotland and the North of England, where farms are let on leases of such length that tenants are supposed to be able to repay themselves for the improvements they make on the land, the question of T.-R. has not yet taken any practical shape, and perhaps never may.

Tenass'erim, a division of British Burmah, S. of Pegu, forming a strip of coast-line, intersected by rivers and fringed with islands, between the mountains of Siam and the Bay of Bengal. Area, 46,730 sq. miles; pop. (1872) 600,727. The inhabitants include the Burmese proper and the exiled Peguese, who are both Buddhists, and the hill-tribe of Karens (q. v.), of whom many have become Christians. This tract was only conquered from Siam in the middle of the last century by the founder of the present Burmese dynasty. In 1824, during the first Burmese war, it was occupied by the British, and formally made over to them by the treaty of 1826. It contains the fertile district of Amherst, with the flourishing port of Moulmein (q. v.), and is reckoned to possess the most healthy climate within the tropics. The products are rice, timber (especially teak and sappan), caoutchouc, iron, and tin. Coal has been found. Other towns are Mergui (q. v.), Tavoy (q. v.), and T., which is now of no importance.

Ten'by, a Pembrokeshire watering-place, on Caermarthen Bay, 9½ miles E. of Pembroke by rail. One side of its old town wall stands almost perfect, but the ruins crowning the peninsular Castle Hill are inconsiderable. Near them a colossal marble statue of the Prince Consort was erected (1865). The Church of St. Mary, with a spire 152 feet high, has been restored, and other buildings are the market-house (1829), fishmarket (1847), assembly rooms, baths, St. Catherine's Fort (1868), &c. T. publishes two weekly papers, and with Pembroke, Milford, and Winton returns one member to Parliament. Pop. (1871) 3996. T. (Cym. *Din-bach y Pysgod*, 'little fortress of fishes') was one of the Flemish colonies planted by Henry I. in Pembrokeshire (q. v.) See Mrs. Hall's *History of T.* (1864).

Tench (*Tinca vulgaris*), a species of Teleostean fishes, common in ponds and lakes, and attaining a length of from 10 to 12 inches. It is very sluggish, apparently inhabiting bottom-waters, and feeding on refuse vegetable matter. The colour is generally a greenish-olive above, a light tint predominating below. The flesh is somewhat coarse and insipid. The T. spawns in May and June. It is very tenacious of life, and may be conveyed in damp weeds for long distances. The T. is usually placed in ponds with Carp (q. v.).

Ten'da, Col de, a pass in the Maritime Alps, between the Italian province of Cuneo and the French department of Alpes-Maritimes, has a height of 6162 feet.

Ten'der of Money is, in many cases, a bar to legal action. A tender of bank-notes is good, unless objected to at the time. So is a tender of foreign coin made current by proclamation. It is sufficient if the tender be to an authorised agent, but a bailiff who makes out a distress cannot delegate his authority, therefore a tender to *his* agent is insufficient. A tender to one of several joint-creditors is a tender to all. In an action for damage, if the defendant make a tender which the plaintiff refuses, should the jury award a sum in excess of the tender, costs will be awarded to the plaintiff, otherwise to the defendant.

Ten'dons, the scientific name of the 'sinews,' or stout fibrous bands which bind and attach muscles to bones. They consist of bundles of white fibrous tissue fibres, are capable of resisting a very considerable strain, and serve by their firm attachment to bones to increase the contractile power of the muscles. Examples are the T. of the *extensor muscles* of the fingers, and the *Tendo Achillis*, which is inserted into the *os calcis* or heel-bone, and which serves as the attached point of the great muscles of the calf.

Diseases and Injuries of T.—T. and their sheaths are not unfrequently inflamed, more especially the sheaths of the long T. of the forearm, after excessive exercise, forming a long, sausage-shaped swelling, and accompanied with considerable pain, and a peculiar creaking sensation when the muscle acts, 'ténosinite crépitante' of French authors. The treatment consists in rest to the parts, and the local application of iodine. Rupture, the result of sudden and violent exertion, sometimes takes place, the usual seat being at the juncture of the muscle and tendon; but sometimes the T. are ruptured, especially the tendo Achilis, the flexor T. of the wrist, the T. of the rectus femoris, and the triceps humeri. The main point of treatment consists in keeping the injured part in a state of perfect rest and relaxation, so that the severed ends may be in close approximation until complete union has taken place. One of the most important diseases of T. is Whitlow (q. v.). For the process of union in divided T. see Adams *On the Reparative Process in Human T. after Division*, and Holmes' *System of Surgery*, vol. iii.

Ten'edos (Turk. *Bogdsha-Adassi*), a Turkish island in the Ægean, 17 miles E. of the Dardanelles, is 5 miles long by 2 broad, and is famed for its exquisite wine. Pop. 2000, partly Greeks.

Teneriffe' ('white mountain'), an island of the Canaries (q.v.), has an area of 1000 sq. miles, and its chief town, Santa Cruz (q. v.), is also the capital of the group. The celebrated Peak of T., locally called the Pico de Teyde, is a remarkable conical mountain, 12,182 feet high, with two summits, the higher of which is called El Piton, and is the peak proper. The other, called Chahorra, is 9880 feet high, and is connected with El Piton by a sharp ridge. Both rise from a circular plain 7000 feet high, 8 miles in diameter, composed of pumice-stone and blocks of lava, and surmounted by a ridge resembling the ramparts of a fortress. Snow lies on El Piton for four months of the year. The view

from the top is magnificent, when not interrupted by a thick layer of cloud which frequently skirts the mountain at a height of 3500–4500 feet, and the peak is visible 100 miles off. The craters on the summits of El Piton and Chahorra appear to be extinct, but smoke and sulphurous vapours constantly issue from vents lower down, and an eruption from orifices on the flanks of Chahorra took place in 1798.

Tenes, an Algerian seaport, 100 miles W. of Algiers. It has an artificial harbour, which is rather exposed to W. winds. T. formerly enjoyed a large export and transit trade, but this has been diverted since the construction of the Algiers-Oran railway, and T. is now steadily declining. Pop. (1877) 3000.

Tenes'mus (Gr. *teinō*, 'I strain') is the term employed in medicine to designate a continual inclination to void the contents of the bowels when no fœcal matter is present in the rectum, the straining being excited by some adjacent source of irritation of the muscles of the *sphincter ani*, produced generally by acrimonious substances. T. is a frequent symptom of dysentery, calculus, irritation of the bladder, stricture, &c. The treatment consists in the removal of the cause; and the local irritation may be relieved by the administration of an opiate enema, or a suppository containing morphia.

Ten'iers, David, 'the Elder,' a Flemish painter, was born at Antwerp in 1582, received his first artistic education from his father, Julian T., and in 1606 entered the famous guild of St. Luke in his native city. The statement that he was a pupil of Rubens is not borne out by his works, but he spent a considerable time at Rome, and there came under the influence of Adam Elzheimer. Familiar scenes from country life are his favourite themes, and when he ventures on great historical scenes he makes little allowance in his treatment for the difference of subject. He died at Antwerp in 1649.—**David T.**, 'the Younger,' son of the preceding, was born at Antwerp in 1610. About 1632–33 his father's influence procured him admission to the guild of St. Luke; but his first efforts appear to have met with indifferent success. By-and-by, however, his merit was recognised; he found a powerful patron in Leopold, Archduke of Austria, who appointed him his court painter and inspector of his gallery; the King of Spain became his ardent admirer; and Queen Christina of Sweden, the Prince of Orange, and lesser dignitaries without number, sought the favour of his pencil. His latter years were spent in his pleasant country seat of De Dry Toren, near Lerck. He died at Brussels, 25th April 1690. T. ranks as one of the very greatest of genre painters; but also produced historical works and landscapes. He painted in all about 1000 works. He has left behind him an immense number of works. Nowhere, perhaps, is he better represented than in the collections of Madrid, Antwerp, Paris, and St. Petersburg. M. Alphonse Wauters in *L'Art* 1877 suggests that there is probably a third David T., son of the second, who signs himself D. T., junior, and that his productions are not unfrequently confounded with those of his father.

Tenn'ant, William, LL.D., a Scottish poet and linguist, was born at Anstruther, in Fife, May 15, 1784. Having studied two years at St. Andrew's University, and finding little satisfaction in his brother's business as a corn-merchant, he became a schoolmaster, first at Denino, near St. Andrews, next at Lasswade, near Edinburgh, and finally in the Academy at Dollar, where he remained fifteen years. In 1834 he was appointed Professor of Oriental Languages in the St. Andrews University, and he continued to hold the post till his death, October 15, 1848. T. is best remembered as the author of the humorous poem *Anster Fair* (1st ed. 1812), written in the then forgotten measure of the *ottava rima*. The rest of his poetical works—*Papistry Stormed; The Thane of Fife; Cardinal Beaton, a Tragedy; John Balliol, a Historical Drama; Hebrew Dramas*, &c.—were all more or less failures. He also published a *Syriac and Hebrew Grammar* (1840). See M. F. Conolly, *Life of W. T.* (1861).

Tenn'ent, Sir James Emerson, son of William Emerson, a rich Belfast merchant, was born at Belfast, 7th April 1794, graduated B.A. at Trinity College, and travelled through Europe and the Levant (1824–25). In Greece he met Byron, whom he emulated in enthusiasm for the Hellenic liberation. He wrote *A Picture of Greece* (1826); *Letters from the Ægean* (2 vols. 1829), and a *History of Modern Greece* (2 vols. 1830). In 1831 he was called to the bar, but never practised, as in the same year he married the daughter and heiress of Mr. W. Tennent, a rich Belfast banker, whose name and arms he assumed. Returned to Parliament by Belfast in 1832, he at first supported Lord Grey, but withdrawing from the Whigs with Lord Stanley and Sir James Graham in the Derby 'dilly,' he ever after followed Peel as a Liberal-Conservative. He was secretary to the Indian Board, 1841–45, to the Colonial Government of Ceylon, 1845–50, to the Poor-Law Board, 1852, and to the Board of Trade, 1852–67. On his retirement from official life in 1867 he was rewarded with a baronetcy. He died in London, 6th March 1869. His later works are *Travels in Belgium* (1841); *Christianity in Ceylon* (1850); *Wine, its Use and Taxation* (1856); *Ceylon, Physical, Historical, and Topographical* (2 vols. 1859); *Natural History of Ceylon* (1860); *The Story of the Guns* (1864), and *The Wild Elephant in Ceylon* (1867). The large general work on Ceylon, still the standard account of the island, went through three editions in 1859, and reached a fifth in 1860.

Tennessee', one of the United States of N. America, stretching E. and W. between the Appalachians and the Mississippi, and bounded N. by Kentucky and S. by Mississippi, Alabama, and Georgia. Area, 46,600 sq. miles, or 29,184,000 acres; pop. (1870) 1,258,520, of whom 936,119 were white and 322,331 coloured. T. is bordered on the E. by the Unaka Mountains, a portion of the Appalachians, and several other ranges parallel to these cross it from N. to S., the most westerly being the Cumberland Mountains. Between these ranges are fertile valleys, the chief being the valley of East T., immediately E. of the Cumberland Mountains. W. of that range the surface is crossed by several hill-ranges of moderate elevation to T. River, beyond which a vast plain stretches to the Mississippi. The geology of T. is very varied. In the E. are Metamorphic and Silurian formations, of which the Unaka Mountains are composed. Coal-measures extend over the Cumberland Mountains, while in the W. the formations are mostly Tertiary and Recent. The navigable rivers of T. are the Mississippi on its W. boundary, the Cumberland (q. v.), and T. (q. v.). In 1870, 19,581,214 acres of land were in farms, of which the value was £43,000,000, while that of the farm productions was £17,000,000. In 1874 T. produced 11,121,000 bushels of wheat (valued at £2,357,000), 238,000 of rye, 31,953,000 of Indian-corn, 3,816,000 of oats, 1,124,000 of Irish potatoes, 1,205,000 of sweet potatoes, 300,000 bales of cotton, and 114,300 tons of hay. T. is the third State in the Union for tobacco, of which 3,500,000 lbs. were raised in 1875. In that year it contained 318,000 horses, 107,300 mules and asses, 2,767,800 cattle, 325,500 sheep, and 1,193,500 swine. The 5317 factories in the State in 1870 were driven by 732 steam-engines and 1340 water-wheels, having an aggregate of 37,983 horse-power, and employing 19,412 hands. There were 216 flouring-mills, 349 saw-mills, 65 furnaces, 395 tanneries, 28 cotton-mills, 220 wheel and carriage works. In 1876 there were 1649 miles of railway opened. The chief town of T. is Nashville (q. v.). Knoxville (q. v.) and Memphis (q. v.) are the next most important. T. was admitted to the Union in 1796, and in the civil war sided with the Confederacy.

Tennessee', a river of T. State formed by the confluence of the Holston and French rivers at Kingston, in East T. It flows S. into Alabama, then W. through that State, and lastly N. through the State of T. into Kentucky, where it joins the Ohio. The T. is 800 miles long, drains 41,000 sq. miles, and is navigable up to Birchwood. There are 1100 miles of navigable waterway on the T. and its tributaries. Rapids interrupt the navigation 280 miles above its mouth.

Tenn'iel, John, an English artist, was born in London in 1820, and, while a mere boy, exhibited at the Gallery of British Artists in Suffolk Street. Self-taught in art, he was chosen in a competition to paint a fresco in Westminster Palace in 1845, and in 1851 was regularly engaged as a draughtsman for *Punch*, in which periodical for many years his bold, graceful cartoons have been a characteristic feature. He has also illustrated 'Æsop's Fables,' 'The Ingoldsby Legends,' 'Alice in Wonderland,' &c.

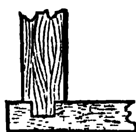
Tenn'is, a ball game played in a specially constructed court by two opponents who keep the ball continually in motion by striking it with a racket. Games of ball have a very remote

origin. The Greeks indulged in them, and considered Aristonicus worthy of a statue for his skilful play. Throughout the dark ages the ancient game seems to have undergone various modifications in different European countries. T. is supposed, from the terms still used in the game, to have originated in France prior to the 15th c. It became very fashionable in England during Charles II.'s reign, but is now superseded by rackets, for which there are courts at the universities and public schools. A racket-court measures 120 feet long and 45 broad, and is divided by a net across the centre into the *dedans* and *hazard* sides, in each of which a player is stationed. Each side is subdivided into *first gallery*, *door*, *second gallery*, and *last gallery;* on the dedans side, the last gallery has six compartments called *chaces*, and two like compartments occur in the second gallery of the hazard side. The play begins from the dedans side, hence it is also known as the *service* side, and the game is played in *sets* of six games of four strokes each. A marker is required to note the progress of the play. See *The Annals of T.*, by Julian Marshall (*Field* Office, 1878).

Tenn'yson, Alfred, Poet-Laureate, was born in 1809 at Somersby, Lincolnshire, of which parish his father, the Rev. George Clayton T., was rector, his mother being a daughter of the Rev. Stephen Fytche. His father, a man of strong character and wide acquirements, conducted his early education, as well as that of his two elder brothers, Charles (now the Rev. Charles T.-Turner) and Frederick, both of whom have likewise published poems, the former being especially well known for the grace and delicacy of his sonnets. It was in conjunction with his brother Charles that T., then an undergraduate of Trinity College, Cambridge, made his first poetical venture, in the shape of a small octavo volume of 228 pages, entitled *Poems by Two Brothers* (Louth 1827). These attracted very little attention, and are said indeed to have shown but slight promise. Two years afterwards (1829), T. gained the Chancellor's gold medal at Cambridge for a poem on the subject of *Timbuctoo*, when he had for one of his competitors the friend whom he has since immortalised, Arthur Henry Hallam. His next publication, *Poems, chiefly Lyrical* (Lond. 1830), was reviewed by Professor Wilson in *Blackwood's Magazine* (May 1832) so harshly as to call forth a so-called 'epigram' from the young poet, in which he repaid 'crusty Christopher' in his own coin. His third volume, *Poems by A. T.* (Lond. 1833), did little to increase his fame, though it contained some of his best-known shorter pieces, such as *The Dream of Fair Women*, *The Palace of Art*, *The May Queen*, and *Œnone*. With a wisdom rare in young writers, he now kept silence for ten years, allowing his genius to ripen until it burst upon the world fully matured in the *Poems by A. T.* (2 vols. Lond. 1842). These at once gave him a foremost place among English poets, and his subsequent works have almost invariably added to his reputation. A proof of his growing fame may be found in the fact that Bulwer Lytton considered it worth his while in 1846 to make a violent attack upon 'school-miss Alfred' in his *New Timon*. To this T. rejoined in some intensely scornful verses published in *Punch*. In 1847 appeared *The Princess*, but it was not until the third edition (1850) that the poem assumed the form in which we now know it, with the intercalated lyrics. Seventeen years after the death of the friend it commemorates, *In Memoriam* was published (1850), and in the following year T. succeeded Wordsworth in the laureateship. His first work in his new capacity was the *Ode on the Death of the Duke of Wellington* (1852). *Maud* followed in 1855, four of the *Idylls of the King* (*Enid*, *Vivien*, *Elaine*, and *Guinevere*) in 1859, *Enoch Arden* in 1864, the remaining *Idylls* at intervals between 1867 and 1872, and lastly the dramas of *Queen Mary* (1875), and *Harold* (1876). T. is said to be engaged at present on a third drama on the subject of Thomas-à-Becket. His shorter poems have appeared at intervals in different periodicals (the *Examiner*, *Macmillan's Magazine*, *Good Words*, the *Nineteenth Century*, &c.), but have almost all been collected in the numerous and ever-increasing editions of his works. One or two patriotic songs, notably one beautiful lyric entitled *Hands all Round*, which appeared in the *Examiner* and in the *Times* about 1852, have been generally attributed to T., but have not been acknowledged by him. T. married in 1851, and has a numerous family. He resides for the most part at Farringford, near Freshwater in the Isle of Wight, and at Aldworth in Surrey, leading a very retired life, and seldom or never appearing in public. So uneventful has his life been that his biography almost merges into bibliography, and the best authorities for both are R. H. Shepherd's *Tennysoniana* (Lond. 1866), and an article on *The Bibliography of T.* in the *Fortnightly Review* (October 1865). See also J. H. Smith's *Notes and Marginalia on A. T.* (Lond. 1873), and *Tennysoniana* (2d ed. revised and enlarged, Lond. Pickering & Co., 1879).

Few poets have been subjected to so searching a criticism as T., and it cannot be said that a final verdict has yet been pronounced. There was a time when T. was considered the rarest poet that England had ever produced; when men thought that no verse had ever before attained such glow of colour or music of sound, and that no poet had ever chosen such noble, refined, and suggestive themes. The finer life of the nation, the grace, sweetness, purity, and simplicity of English homes, breadth of intellectual sympathy, ardour of hope, faith in freedom, and religious reverence, all found so genuine an expression in his writings that the generosity of youth could put no bounds to its admiration. If the future insists on some abatement of the glowing estimates of the past, if it becomes conscious of defects and limitations, and learns to feel the art more than the inspiration, one can hardly suppose that it will ever cease to experience delight in the most exquisite literary workmanship of the 19th c. Among the most systematic critical studies are E. C. Tainsh's *Study of the Works of A. T.* (Lond. 1869), and H. Elsdale's *Studies in the Idylls* (Lond. 1878). See also Kingsley's *Miscellanies* (Lond. 1859), Bayne's *Essays* (Edin. 1859), J. H. Stirling's *Jerrold, T., and Macaulay* (Edin. 1868), A. H. Japp's *Three Great Teachers* (Lond. 1865), Essays by Professor Dowden and Professor Ingram in *Dublin Afternoon Lectures* (Lond. 1863, &c.), Taine's *English Literature* (book v., chap. vi., Edin. 1874), Robert Buchanan's *Master-Spirits* (Lond. 1873), R. H. Hutton's *Essays* (2d ed. Lond. 1877), H. B. Forman's *Our Living Poets* (Lond. 1871), E. C. Stedman's *Victorian Poets* (Lond. 1876). The late F. W. Robertson published an interesting *Analysis of In Memoriam* (5th ed. Lond. 1873), and on the subject of this poem reference should also be made to the paper on A. H. Hallam in Dr. John Brown's *Horæ Subsecivæ* (new ed. Edin. 1875). The *Remains of Verse and Prose* of A. H. Hallam, privately printed in 1834, were published in 1863 (Lond.). There have been many illustrated editions of T., the best known being Doré's *Idylls of the King* (Lond. 1868). In conclusion we must refer to Brightwell's *Concordance to the Works of A. T.* (Lond. 1869). Many of T.'s principal poems have been translated into French, German, Italian, and Danish.

Ten'on (Fr. *tenon*, from Lat. *tenere*, 'to hold'), a projection at the end of a piece of timber for insertion into a hole or mortice of a corresponding size in another piece of timber.


Tenon and Mortise.

Ten'or (from *teneo*, 'I hold;' Ital. *tenore*), the highest of the three divisions of male-chest voices. Its range lies between tenor C, which few tenors take with certainty, and treble A. To this quality of voice was assigned the leading or sustained part in old church music, counterpart being added above and below it; hence the derivation of the name. The T. voice is particularly suited for sentimental and emotional songs. The leading male part in an opera is, with few exceptions, designed for a T. A T.-singer with a light kind of voice is called a *tenore leggiero*, one possessing a voice of full and powerful quality a *tenore robusto*. T. voices are most common in the S. of Europe, especially Italy, but are not unusual in the N., particularly among Celtic nations. The instrument known as the viola is sometimes called the T. The T. clef is the C clef placed on the fourth line of the staff.

Ten'or, Proving of. See PROVING THE TENOR.

Tenot'omy, or the subcutaneous division of tendons, is a surgical operation now very extensively practised in the cure of club-foot and other deformities. The operation was first practised by Stromeyer, who divided the tendo Achillis, in 1831, by subcutaneous puncture. The operation consists in passing a small thin knife through a minute puncture close to the contracted tendon, dividing it, if possible, without injuring any part in its vicinity. The puncture is carefully closed, and the wound generally heals by the first intention. T. is generally employed in the case of club-foot; sometimes to facilitate the reduction of

a fractured bone or a dislocation; also for squint and wry-neck, and various deformities.

Ten'rec or **Tan'rec** (*Centetes*), a curious genus of insectivorous mammalia, the common species of which is often named the 'Madagascar Hedgehog.' The *C. ecaudatus*, the common species, attains the size of an ordinary hedgehog. The T. has a covering of spines, which are variegated with black and yellow, and are about an inch long. The under parts are covered with coarse hairs. The T. feeds on worms, snails, small reptiles, and like fare. Although a powerful odour of musk is exuded from the T., the natives of Madagascar esteem the animal when cooked a luxury. Other species are the Spiny T. (*C. spinosus*), and the Banded T. (*C. Madagascariensis*).

Tense. See CONJUGATION.

Tent, a movable dwelling formed by canvas supported by poles or a light framework, and stretched and held down by ropes secured to pegs driven into the ground. Tents have always been the dwellings of pastoral tribes who wander from one fertile spot to another. During patriarchal times the covering materials were made of animals' skins and spun goats'-hair. The form of the primitive structure is most probably preserved in the present Arabian T., which is oblong in plan and 8 or 10 feet high, with sloping sides. Considerable ingenuity has been expended in modern times in the construction of tents for the use of emigrants, travellers, missionaries, sportsmen, and soldiers; combining the essential qualities of portability, capability of being expeditiously 'pitched' or 'struck,' and of resisting high winds, good ventilation and dryness. The 'bell-T.' of the



Travelling or Military Tent.

British service is 40 feet in circumference, with one central pole, and it accommodates from 12 to 14 men, who at night lie radially around the pole, their feet being towards it. Mr. Benjamin Edgington of London has designed a military or travelling T. which is in every respect superior to the bell-T. It is pyramidal in form, and the angles are strengthened from the head by a stout rope to which the canvas is 'bolted,' and which is secured by strong iron pegs to the ground, thereby constituting the main support of the T. A porch sustained by a light pole is formed at each of two opposite sides, giving entrances to the dwelling and affording a thorough draught of air. Ventilating apertures are also provided at the top. The central pole and the smaller poles are divided into lengths for convenience of packing. A T. of this description, 15 feet square, is capable of comfortably accommodating 16 men with knapsacks and rifles. As shown in the 'cut,' an iron chimney, connected with a warming, ventilating, and cooking stove, may be substituted for the centre pole. The chimney is supported by a tripod stand, the legs of which rest on a rack which prevents them sinking in the ground, and admits of the T. being raised or lowered according to the action of the weather on the canvas. A very simple, compact, and portable hammock-T., admirably adapted for the soldier, sportsman, or pleasure-seeker, has lately been invented and patented by Mr. C. H. Leycester, Gwynfè, South Wales. The 'Gwynfè' T., which was exhibited at the Paris Exhibition (1878), and was awarded a prize medal, consists of a secure slender framework of six short lengths of bamboo or ash tipped with metal, two of these fitting together to form a horizontal stretcher from which a hammock is slung and over which a waterproof sheeting is thrown. It stands by itself on any kind of ground, and dispenses with ropes, pegs, or trees. When folded for carriage it forms a light portable parcel. A large field T., such as is erected for out-door fêtes, is known by the name of *marquée*.

Ten'tacles, the name given to the tactile appendages common in lower animals (*e.g.*, sea-anemones, corals, zoophytes, &c.), and which subserve prehension and touch, or both of these.

Tentac'ulites, a curious genus of fossils occurring in Lower Silurian to Devonian Rocks, and of which *T. ornatus* (*U. Silurian*) is a familiar species. T. was formerly regarded as a genus of Tubicolar or tube-forming worms, but it is now believed by most palæontologists to be an extinct genus of Pteropoda.

Ten'terden, a market-town in the Weald of Kent, 18 miles S.E. of Maidstone, was anciently only 2½ but now is 15 miles from the sea, and still possesses the privileges of a Cinque Port. The noble Perpendicular steeple of its church is said by Kentish folk-lore to have been the cause of the Goodwin Sands, a Bishop of Rochester having diverted to its erection funds destined for the maintenance of sea-walls. Other buildings are a town-hall (1792), a Benedictine Priory, and a market-house. Pop. (1871) 3557, mostly agricultural.

Ten'terden, Charles Abbot, Lord, a barber's son, was born at Canterbury, 7th October 1762, and from the King's School of his native city passed to Corpus Christi College, Oxford. Having gained a scholarship, a fellowship, and two chancellor's medals, he was called to the bar (1795), and on the Oxford circuit soon made a considerable fortune. Created a puisne judge in the Court of Common Pleas (1816), he was knighted in 1818, and in 1827 raised to the peerage. He died at Bristol, 4th November 1832. His *Treatise of the Law relative to Merchant Ships and Seamen* (1802) is a standard authority on the subject.

Tenuiros'tres ('slender-billed'), a group or section of the Insessorial or perching birds, characterised by a long and delicate beak, which tapers to a point. The toes, as a rule, are also slender, and the hinder toe is especially long. These birds feed upon insects, and many subsist on flower-juices. The chief families included in this group are the *Certhidæ* (creepers), *Trochilidæ* (humming-birds), *Meliphagidæ* (honey-eaters), *Promeropidæ* (sun-birds), and *Upupidæ* (hoopoes).

Te'nures of Land. Nearly all the real property of England is supposed to have been granted by a superior lord, and to be held from him in consideration of certain services to be rendered to him by the tenant. By 12 Car. 2, cap. 24, military T. were changed into *Socage* (q. v.). See also BURGAGE TENURE; BOROUGH, ENGLISH; GAVELKIND; COPYHOLD. Under COMMON, COMMON TENANCY, FREEHOLD ESTATE, FEE SIMPLE. In Scotch law, see FEU HOLDING.

Teocall'i (= 'house of God') or **Teopan** (= 'place of God') were the names of the temples of the native Mexicans. They were generally solid, quadrilateral, truncated pyramids, built of earth cased with brick. On the upper surface were several large towers, forming the temple proper, and containing the images of the gods. The pyramid was surrounded by several slightly spiral terraces. A staircase ascended at one of the angles to the first terrace, which went round the building with a slight ascent till it came directly above the top of the stair; from this point another stair led up to the second terrace, and so on. Thus it was necessary to go round the building several times before reaching the platform at the top. On this platform a fire burned always, and was visible at a great distance. Human and other sacrifices were offered here. The T. were very numerous; every large town had several hundred. The best preserved are those at Cholula and Palenque.

Tep'litz. See TÖPLITZ.

Terai' or **Turrye'** (*tarai* from *tar*, Pers. for 'moist'), the name for the narrow strip of swampy jungle which uniformly underlies the lowest ridge of the Himalaya Mountains in the N. of India, continuously from Kumaon to Assam. This is about 15 miles wide, and is kept perpetually moist by rivulets, and by infiltration from a peculiar bed of boulders and sand, called *bahbur*, which immediately adjoins it above. It is overgrown with jungle and enormous grasses, the home of tigers and other wild beasts. At no time can it be healthy, and at certain seasons of the year the malaria is absolutely fatal to strangers, though the aboriginal tribe of Therus seem to flourish. Proceeding from the W., the first portion lies in the Rohilcund division of the N.W. Provinces, forming the *district* of T., with an area of 920 sq. miles, and a pop. (1872) of 185,658; the chief town is Kashipur. The next portion, bordering Oudh and Behar, lies chiefly within Nepaul territory. The third piece was annexed from Bhotan after the war of 1864, and is known as the E. and W. Duars.

Tera'mo (anc. *Interamna*), a town of S. Italy, province of Abruzzo Ultra I., on the left bank of the Tordino, 35 miles S. of Fermo, with manufactures of wax, cream-of-tartar, liquorice, leather, earthenware, straw-hats, and art-furniture. Pop. (1877) 20,138.

Ter'aphim (Heb., properly a plural, but used also, like Elohim, for a single object), as appears from a consideration of all the passages of the Old Testament in which the name occurs, seem to have been larger or smaller *images* which were perhaps worshipped as household gods by the Israelites from the earliest periods of their history (*cf.* Gen. xxxi. 19, 34, 35), till at least after the Captivity (Hos. iii. 4; Zech. x. 2, 'idols'). Not only was the prosperity of a family believed to depend on their possession (*cf.* Gen. xxxi. 35), but they were used as oracles, like the Ephod (q. v.), and consulted regarding the future (*cf.* Jud. xvii. 5, xviii. 3-6; Ezek. xxi. 21, 'images'; Zech. x. 2).

Teratol'ogy. See MONSTER, MONSTROSITY.

Ter'burgh, Gerhard, a Dutch painter, was born of good family at Zwolle in 1608. He travelled in Germany, Italy, Spain, and England, and wherever he went acquired a great reputation. He finally settled at Deventer, and there filled the office of burgomaster. His death took place in 1681. Among his paintings may be mentioned the portrait of William of Orange, the 'Father's Advice' celebrated by Goethe in his *Wahlverwandschaften*, and the 'Congress of Munster in 1648,' which was sold at the Demidoff sale for £7280, and was presented by Sir William Wallace to the national collection (see *Athenæum*, 1871). T. is remarkably successful in representing silks and satins, and many of his paintings have been evidently designed to show off his technical skill. Constantine T., his daughter, was an excellent copier of her father's works. T. is well represented in English private collections, and also in the galleries of Dresden, Munich, Vienna, Berlin, Amsterdam, and the Louvre.

Terce is one of the two *legal* liferents in the law of Scotland, being a real right constituted without covenant, or sasine. By it a widow, who has not accepted any special provision, is entitled to the liferent of one-third of her husband's heritable (real) estate, provided the marriage has lasted for a year and a day, or has produced a living child. If special provision is granted by a husband to his wife by any antenuptial or postnuptial contract or other deed, the wife shall be thereby excluded from her T., unless the contrary be provided in the same deed. The liferent bears its proportion of burdens affecting the estate. The mansion-house, if there be only one, feu-duties, rights of reversion, superiority, and patronage, are not subject to the right of T. For English law see DOWER.

Tercei'ra ('third,' so called from the order of its discovery), the second largest of the Azores, has an area of 220 sq. miles, with a pop. of 50,000. The coast is precipitous, and fortified where accessible, and the land rises so as to form a lofty central plateau, on which great numbers of cattle are reared. Maize, wheat, oranges, timber, and orchil are exported, but the wine produced is poor. The chief town, Angra (q. v.), is also the capital of the group.

Terebran'tia, a group or division of *Hymenopterous* insects which have a boring apparatus as the terminal appendage of the abdomen. By means of this they bore into the bark of trees for the purpose of inserting their eggs.

Terebrat'ula, a genus of *Brachiopodous* mollusca, forming the type of the family *Terebratulidæ*, in which the shell is minutely punctated, and the ventral or lower valve has a prominent beak, which is perforated by an aperture for the transmission of a muscular stalk or *peduncle*, by means of which the animal attaches itself to fixed objects. The arms are supported by a 'carriage-spring apparatus' of living loops, contained within the dorsal or upper valve. The loops are very short. T. is a genus, including several living species, of which *T. Australis* is familiar. Fossil species of T. commence in the Devonian Rocks, and are well represented onwards to the present day.

Tere'do or **Ship'worm** (*Teredo navalis*), a very peculiar species of *Lamellibranchiate* mollusca, belonging to the family *Pholadidæ*. Linnæus styled it '*calamitas navium*,' from the ravages it works on the timber of ships. It has at its anterior extremity two small shelly valves, the long wormlike body being formed by the *siphons* or breathing tubes, which are inclosed within a lining, covering, or encrustation. The shell is globular in shape, and is open in front, its valves being three-lobed. The ravages of the T. annually cost the British Government many thousands of pounds for repairs of timber at seaports. Holland has been more than once threatened with destruction from the attacks made by the T. on the wooden piles which support the *dykes* or mounds of that kingdom. The only certain preventive of T. attack is to drive large-headed nails into the exposed piles. A large species of T. (*T. gigantea*) occurs in tropic seas, and does good service in disintegrating and breaking up floating timber and driftwood.

Terek' (Armen. *Terchyk*), a river in Russian Caucasia, rises near Mount Kasbec, flows in an easterly direction, and enters the Caspian by many branches after a course of 350 miles. It has a descent, after reaching the plain (Mosdok), of 40 centimetres to the kilometre, and is utilised for irrigation in the district to which it gives name, and which is specially noted for its warm springs and petroleum-wells. The *district*, lying between the government of Stavropol and the highlands of Daghestan, has an area of 34,637 sq. miles, and a pop. (1876) of 485,237, mostly Mohammedans and Cossack settlers.

Teren'tius Afer, Publius, was born at Carthage, whence his surname *Afer*, B.C. 185 (*Teuffel*). Some authorities place him ten years earlier. Following immediately after Cæcilius, the most popular representative of Roman comedy after Plautus, he was the last of the comic dramatists of Rome of whom we have anything remaining. The extant records of the life of T. are more than apocryphal. His history, so far as it seems worthy of acceptance, may be briefly given. T. was either taken prisoner in war or sold in the slave-market. His purchaser, or at all events the Roman into whose hands he fell, was a senator, Lucanus Terentius. On obtaining his freedom he took his patron's name. A liberal education followed, and we soon find him the friend and associate of the great and noble. T. was gifted with dramatic genius. Whether his plays were his unaided productions, or were amended by his patrons Lælius and the younger Scipio, matters but little. The works that bear his name are as much his genuine compositions as are the plays of our own Colman, Cumberland, or Gay, whose dramas were admittedly combed and corrected by competent hands before representation. T. was beyond question the chief dramatist of his time. He used, moreover, the Latin tongue with singular grace and elegance. Critics have denied to him the possession of lively humour (*vis comica*). Ancients and moderns, however, are agreed that, although a freedman and a foreigner, he divides with Cæsar and Cicero the palm of pure Latinity. T. was the interpreter of Menander; but he was more than a mere translator. His six comedies that remain belong to the *Fabula Palliata*. It is said that T. went to Greece, and translated 108 of Menander's plays. Whether he was lost on his homeward voyage, as some say, or lost his transcripts and died of grief in consequence, we have no means of deciding. Probably his stock consisted of little more than notes: translations could hardly have been produced during his brief sojourn. T. died in his twenty-sixth year, 159 B.C. He owned an estate of twenty *jugera* contiguous to the Appian Way, and after his death his only daughter married a Roman knight. The following are his comedies, with the years of their production:—(1) *Andria*, 'The Woman of Andros,' B.C. 166; (2) *Hecyra*, 'The Stepmother,' B.C. 165; (3) *Hautontimoroumenos*, 'The Self-

Tormentor,' B.C. 163; (4) *Eunuchus*, 'The Eunuch,' B.C. 162; (5) *Phormio*, B.C. 162; (6) *Adelphi*, 'The Brothers,' B.C. 160.

The *editio princeps* of T. was published at Strassburg in 1470. Other noteworthy editions are those of Muretus (Ven. 1555), Madame Dacier (Par. 1688), Bentley (Camb. and Lond. 1726), A. Fleckeisen (Leips. 1857), Parry (Lond. 1857), W. Wagner (Camb. 1869). See Dunlop's *Rom. Lit.*, vol. i. p. 110, *et seq.*; Dryden's *Essay on Dramatic Poesie*; *Plautus and T.*, by the Rev. W. L. Collins in Blackwood's *Ancient Classics for English Readers* (Edinb. 1873); and Francke, *T. und die lateinische Schulkomödie in Deutschland* (Weim. 1877). The works of T. have been translated into almost every European tongue.

Tere'sa, St., Spain's patroness, was born of the noble Cepeda family at Avila, in Old Castile, 28th March 1515. Losing her mother at the age of twelve, she gave herself up to reading tales of chivalry and to girlish coquetry, till in 1531 her father placed her in an Augustinian convent. Here the desire seized her of entering the religious life; during an illness she sought her father's leave, and, though he withheld it, was received as novice by the Carmelites of her native town, 2d November 1533. 'Her passionate nature,' to quote George Eliot's *Middlemarch*, 'demanded an epic life. What were many-volumed romances of chivalry and the social conquests of a brilliant girl to her? Her flame quickly burnt up that light fuel, and, fed from within, soared after some illimitable satisfaction, some object which would never justify weariness, which would reconcile self-despair with the rapturous consciousness of life beyond self. She found her epos in the reform of a religious order.' Yet was she long in finding it—nigh thirty years, passed under the Mitigated Carmelite Rule, being chiefly marked by T.'s frequent illnesses, her father's death (1541), her yearnings towards the world, and her perusal of the *Confessions of St. Augustine*. Then came two years and a half of 'intellectual visions' (1559-61), during which she conceived the notion of restoring the original severe Rule of her order. Good and learned men regarded her inspirations as satanic delusions, her seeking after a stricter life as presumptuous, but in 1562 she obtained from Pius IV. a bull allowing her to found the little convent of St. Joseph, where with twelve nuns she gave herself up to rigid asceticism. Her reforms were extended during her lifetime to 17 convents and 16 monasteries, but T. herself remained a simple nun till 1581, when she was chosen prioress of the convent of Avila. She died at Alba de Tormés, in Leon, 4th October 1582; and in 1621 she was canonised by Gregory XV. Founder of the Spanish mystic school, T. yet was ever saved from fanaticism by her excellent commonsense. Her classic *Obras* (Sal. 1588; 2 vols. Mad. 1861-62), containing her autobiography, letters, *El Camino de perfeccion*, *Las Fundacionnes de las Conventos de las Carmelitas*, &c., enshrine the genius, candour, and fascination of the only woman on whom has been conferred the title of 'Doctor of the Church.' See M. Trench's *Life of St. T.* (Lond. 1875).

Terliz'zi, a thriving town of Italy, in Apulia, province of Barri della Puglie, 8 miles S.W. of Molfesta, with mediæval remains, and exports of wine, oil, and fruits. Pop. (1874) 18,261.

Term. The terms for the sitting of the law courts in England are Hilary, Easter, Trinity, and Michaelmas. The terms for paying rent in England and Ireland are Lady-day (March 25), Midsummer-day (June 24), Michaelmas-day (September 25), Christmas-day (December 25). In Scotland the money terms are Whitsunday (May 15) and Martinmas (November 11). Houses in Scotland are usually let from 26th May for a year or a period of years.

Ter'mini Imere'se, a thriving seaport on the N. coast of Sicily, on a promontory at the mouth of a river of the same name, 23 miles E.S.E. of Palermo by rail. It has considerable fisheries of tunny and anchovies, and its macaroni (*pasta*) is considered the best in Sicily. Pop. (1877) 21,389. T., the ancient *Thermæ Himærenses*, was founded by the Carthaginians in 407 B.C., and fell into the hands of the Romans in 252. Many Roman remains exist, and a fine collection of antiquities is preserved in the Liceo.

Ter'minus, a Roman divinity, identical, according to Ovid (*Fasti* ii. 639 *et seq.*), with Jupiter, was reverenced from the earliest times as the protector of the boundaries of property both public and private. His festival, the *Terminalia*, was celebrated with bloodless sacrifices at the *termini* or boundary-stones.

Ter'mites, the scientific appellation of the 'White Ants,' insects belonging to the order *Neuroptera* (q. v.). The head in the T. is short, and the antennæ are 20-jointed. The abdomen is ovate, and the mandibles are small and triangular. In *Termes* itself the head is large and rounded. White ants occur in tropical climates. In Africa, for instance, they construct large nests, and live in social colonies which exhibit a high degree of organisation. The male and female are winged, and resemble each other. The *neuters* or *workers* are divided into *ordinary workers* which perform all the duties of the colony, and *soldiers*, provided with large mandibles, by means of which the defence of the colony is secured. Some of the workers (*Nasuti*) have a long protuberance in front of the head. The wingless T. are asexual, the work of reproduction being performed by the winged and sexual forms. The nest occasionally attains a large size. It is divided internally into chambers and galleries, and contains apartments set apart as nurseries and as feeding-places for the young. The nest of some species (such as *Termes fatale*) may resemble conical hillocks, and often attain a height of 12 feet. After impregnation, the females become wingless. Their bodies swell enormously as they become gravid with eggs, the abdomen sometimes measuring 2 inches, and the eggs being often deposited to the number of 80,000 per day. The common termite, or white ant of America, is the *Termes flavipes*. It occurs under stones and wood, and is of a chestnut colour, the head and prothorax being blackish brown. The workers are white, with yellowish heads. *Termes lucifugus* is a French species, the young or pupæ of which were found by Latreille to be provided in the spring with four wing-pads. This latter species is destructive to wood; while *Termes flavicolus* injures the Spanish olive-trees.

Tern or **Sea Swallow** (*Sterna*), a genus of birds belonging to the order *Natatores*, or swimmers, and to the family *Sternidæ*. The bill is long, slender, and straight; the wings are long, powerful, and pointed; the tail is forked; and the first quill is the longest. The hinder toe is short, and not united to the other toes by membrane, and the legs are also short. The *Sterna hirundo*, or common T., is a familiar sea-bird, flying abroad with great activity in the stormiest weather. It attains a length of from 12 to 15 inches, and is black above mixed with ashy grey, and white beneath. The legs, beak, and feet are red. An allied species is Wilson's T. (*Sterna Wilsonii*).

Terna'te, one of the Moluccas (q. v.), to the W. of Gilolo, has a volcano 4925 feet high, is covered with tropical vegetation, and produces great variety of spices. The town of T. (pop. 6000), the seat of a Dutch resident, is defended by Fort Oranien. The *Dalem*, or palace of the sultan, is a grand building.

Ter'ni, a town of Central Italy, province of Perugia, between two arms of the Nera (*Nar*), 50 miles N.N.E. of Rome by rail. The seat of a bishop, it has a cathedral, several palaces, ruins of an amphitheatre, an institute for mechanics, &c. There are cloth, silk, and leather industries, and considerable culture of oranges, olives, and the mulberry. Pop. (1875) 15,500. The ancient *Interamna*, it is the supposed birthplace of Tacitus. In the vicinity is the famous waterfall of Velino. At T. the Neapolitans were defeated by the French, 27th November 1798.

Ternstrœmia'ceæ, a natural order of thalamifloral *Polypetalæ* containing about 300 species found round the world in the tropics. Of these the beautiful cultivated Camellia (q. v.) is perhaps the best known, and the Tea Shrub (q. v.) is the most important. *Gordonia lasianthus*, the loblolly bay of America, is a handsome tree growing to a height of 60 feet, and bearing snowy-white flowers; its bark is extensively used for tanning in the Southern States. *Kielmeyeria speciosa* of Brazil has flowers resembling the mallow, and possesses mucilaginous properties, a decoction being employed for fomentations. The leaves of *Freziera theoides*, a common W. India species, are astringent, and have a taste like tea, for which they are locally made a substitute.

Terpsi'chore (Gr. 'the dance-enjoying') appears in the *Theogony* of Hesiod as one of the nine Muses (q. v.). In later times she especially presided over choral song and dancing.

Terraci'na (the *Anxur* of the ancient Volsci and the *Tarracina* of the Romans), a town of Italy, in the province of Rome and district of Velletri, on the sea-coast, at the S.E. extremity of the Pontine Marshes, 11 miles S.W. of Fondi. Its harbour, anciently a Roman naval station, is now filled up. T. is an epis-

copal seat, and has a cathedral of S. Pietro built on the site of an ancient temple of Jupiter Auxurus, while on the summit of the promontory and overlooking the town is the palace of Theodoric, afterwards converted into a castle. T. was important in ancient times as commanding the pass on the Appian Way between the mountains and the sea. Pop. (1874) 7376.

Terr'a Cott'a (It. 'baked clay') is simply a superior variety of brickwork made with a fine clay, and often modelled or worked into highly artistic forms, or used in architectural or decorative structure. From classical times T. C. was a favourite substance for statuary figures and statuettes, as well as for ornaments *en relief;* and during the Middle Ages it was extensively employed in architecture, especially in Italy. Recently T. C. has come into great favour in London as a decorative building material, and in the pottery of Doulton & Watts at Lambeth, groups, statuary figures, and relief works have been produced which show extraordinary skill and energy of modelling, and great technical dexterity in dealing with the material. T. C. should be close and smooth in texture, and ought to keep a fine bright colour under exposure to a smoke and acid-laden atmosphere.

Terr'a Firm'a (Span. *terra firme*), a term sometimes used to denote the 'Spanish Main' or the N.W. coast of S. America; or the part of the Italian mainland once subject to Venice, and more popularly to denote land as opposed to water.

Terr'a Japon'ica. See CATECHU.

Terrano'va (anc. *Gela*), a town on the S. coast of Sicily, 41½ miles S.E. of Girgenti, stands on a hill. In 1874 there entered 172 vessels of 14,931 tons, and cleared 190 of 10,882 tons, the exports (cotton, fruit, sulphur, &c.) amounting to £105,811, the imports to £74,893. It was founded by the Emperor Friedrich II. Pop. (1874) 14,686. T. is also the name of a small town on the N.E. of Sicily. Pop. 3500.

Terr'apin, a general name applied to various species of freshwater tortoises belonging to the family *Emydidæ*. The group includes the river and marsh tortoises, in which the jaws are horny and have cutting edges, the tympanum of the ear is exposed, and the limbs have each 5 toes united by a web. In the T. or 'Terrapenes' proper the pelvis is free, and the neck is capable of being bent in a vertical plane. The head is almost entirely hidden by the carapace when retracted. The principal genera of T. are *Emys* (q. v.), *Cistudo,* and *Chelydra.*

Terre Haute, capital of Vigo county, Indiana, U.S., on the Wabash River, about 150 miles W. of Cincinnati, and 170 N.E. of St. Louis by rail. The surrounding district (known as Harrison Prairie) is one of the most fertile in the States, and at the same time well provided with coal, hence T. H. has grown with a rapidity unusual even in American cities. It is an important railway centre, has fine churches and public buildings, and supports several newspapers. Pop. (1876) 25,000.

Terres'trial Mag'netism. At every point on the earth's surface a magnetic force acts, having a definite direction and magnitude. To completely fix this force three co-ordinates must be given; and these are usually the *declination* or azimuth of the force, the *dip* or inclination to the horizon, and the total *intensity.* These so-called magnetic *constants* vary from place to place upon the earth's surface, and their experimental determination is now an important item in meteorological science, and should be made at as many stations as possible. It is not enough, however, to make one determination, for observation has established that the declination and dip not only vary from place to place, but vary from hour to hour and day to day at any one place. The declination, which is measured by means of a delicately-suspended magnet free to rotate round a vertical axis, is always measured as so many degrees E. or W. of north. Thus at Greenwich the declination is at present 18° 45' W. of N., in 1850 it was 22° 29'·5 W. of N. It appears, then, that for this place the declination is subject to a gradual secular variation, and the same has been established for every place at which observations have been made. Not only so, however, but the declination is subject to a periodic *annual* variation and a periodic *diurnal* variation, which are subject to a greater variation whose period is about 10½ years. At certain times, when so-called magnetic storms are raging, these oscillatory variations are very marked, and their connection with auroræ boreales and sun-spots may be regarded as now thoroughly established. The declination has been observed as much as 43° 14' W. of N. at Reykavik, Iceland, and 31° 38' E. of N. at Port Etchez, N. America. The declination is very small for places in the S. of Asia. A line drawn through points which have the same declination is called a magnetic meridian or isogonic line, and all such lines meet in two regions on the earth's surface known as the magnetic poles, which, however, are not diametrically opposite each other. There are corresponding lines, called *isoclinic lines,* connecting places which have the same *dip.* The determination of the dip or angle of inclination which a magnet, set in the magnetic meridian and suspended so as to have free rotation round a horizontal axis through its centre of mass, is a much more difficult investigation. It is effected by means of the Dipping Needle (q. v.). The isoclinic line, for which the dip is zero, is called the magnetic equator, and at the magnetic poles the dip is 90°. South of this magnetic equator, the dip is *negative, i.e.,* the S. pole of the magnet dips down and the N. pole points up. The declination and dip for a given place determine the direction of the lines of magnetic force, to fix which completely requires the total intensity of the force in this direction. This intensity is not usually given, but only its horizontal component, the measurement of which is more easily effected experimentally. It is measured by observing the time of oscillation of a small magnet whose magnetic moment is known (see MAGNETISM). According to Airy, the locality of greatest horizontal magnetic intensity is in latitude 0°, longitude 259° E., where its value is ·3733, expressed in centimetre, gramme, and second (see UNITS). At Greenwich the mean horizontal intensity is ·1794; and the total intensity, taking the dip (67° 35') into account, ·4704. The greatest total intensity is in South Victoria, where its value is ·7898; and the least total intensity is near St. Helena, where its value is ·2828. The theory of T. M. has occupied the attention of some of our greatest mathematicians and physicists. Gilbert, and, following him, Euler, regarded the earth as a bar magnet with two poles; Halley and later Hansteen claimed two magnets and four poles as giving results agreeing better with observation. The first to place the theory in a satisfactory state, however, was Gauss, who, freeing himself from all speculation as to the *origin* of the earth's magnetic force, and assuming only a *polarity* characterised by repulsions and attractions acting according to the inverse square, developed a mathematical expression called the Potential Function (see POTENTIAL), upon which the distribution of magnetism throughout the earth depended. This function, though quite indeterminate on account of our ignorance of this distribution, must have certain properties from which Gauss deduced several wonderful results. Thus he proved that there was only *one* N. pole and *one* S. pole, and that given the N. component of the horizontal intensity for all places on the earth's surface, the E. or W. component follows. See Gauss's *Atlas des Erdmagnetismus,* and Clerk Maxwell's *Electricity and Magnetism.*

Terre-Plein, in Fortification (q. v.), is the platform upon which the guns are placed and worked.

Terr'ier, a name widely applied to certain breeds of dogs, usually of small size, but exhibiting very great variations in colour, hair, and general conformation. The name, indeed, has little or no special significance, but indicates any small breed of dog, and perhaps most specifically the rough-haired varieties used in killing vermin. The chief varieties of T. are the Scotch, Skye, and English T., the latter being a smooth-haired breed, of which the purest colour is black-and-tan. The Fox T. is more properly called a Foxhound (q. v.), and the Bull T. is a cross between the T. and Bull Dog (q. v.).

Terschell'ing, the third in the chain of islands stretching N. from the peninsula of N. Holland, lies near the entrance to the Zuider Zee. Area, 45 sq. miles; pop. (1876) 3128, mostly engaged in shipbuilding, fishing, and pilotage. Its fertile meadow-lands are protected by dykes, and there is a good harbour at Westerschelling. William Barentz was born here.

Ter'tian Fe'ver. See AGUE.

Ter'tiary Sys'tem, the whole series of stratified rocks intervening between the Cretaceous epoch and the period of the glacial drift. It is divided into three groups, known as the

Eocene, Miocene, and Pliocene formations, which as they approach nearer to the present time show evidences of gradually increasing similarity in the conditions of things, and a greater resemblance in their fauna and flora to those of our own age. Thus, taking for example the species of shells, we find, according to M. Deshayes, that in the Eocene rocks 3 or 4 per cent. only are identical with living forms; that this percentage in the Miocene is about 17, and finally attains 90 per cent. in the Newer Pliocene. The fauna of the Tertiary epoch is especially remarkable for the increasing development of mammals, and the flora for the great preponderance of dicotyledonous plants. In Britain the greatest exhibition of Tertiary strata is to be found in the south-eastern counties of England; for example, the London clay, and the 'Crag' formations of Norfolk and Suffolk.

Tertullia'nus, Quin'tus Septim'ius Flor'ens, first of the extant Latin fathers, was born about 160 A.D. at Carthage, the son of a proconsular centurion. Brought up a pagan, he was carefully educated in Roman law, more carefully still in Roman rhetoric; and probably he practised as an advocate in Rome itself. After his conversion, whenever that may have taken place, he is said to have been ordained a presbyter, and to have married a Christian wife; but he only continued orthodox till he had reached the middle term of life, going over then to the heresy of the Montanists (q. v.). This defection St. Jerome ascribes to the envy and ill-treatment which T. experienced from the Roman clergy; Maurice, on the other hand, regards it as 'a submission of the intellect, a voluntary abdication of his own judgment.' Be this as it may, a Montanist T. died, at an extreme old age, somewhere between 220 and 240 A.D. His was no lovable character, as shown to us in his works. These savour too much of the law—the law, not of an impartial judge, but of a special pleader. His adversaries, whether pagans, or the Orthodox whom he had lately quitted, or the heretics to whom he should soon desert, could look for no fairness or mercy at his hands. Thus in his *De Spectaculis* he says of the Day of Doom, 'How I shall laugh, rejoice, exult to behold so many sage philosophers blushing in red-hot flames!' in the treatise *De Anima* he argues that since nothing could be known regarding immortality but what God chose to reveal, therefore Socrates was more devil-inspired than ordinary heathens; the peroration of his *Libri Adversus Marcionem* is a singular instance of thieves—here heretics—falling out. Conversely his client for the time being he loaded with fulsome flattery, in the same *De Anima* contrasting Socrates with a Christian martyr, 'who did not swallow the cup with a sort of luxurious enjoyment, but endured to be burnt alive.' Such are some of the defects of T.'s matter; they are not redeemed by his fantastic style, bristling with barbarous terms, uncouth expressions, and far-fetched metaphors. The value of T.'s writings lies in their liveliness and vigorous force, the stubborn conviction that T. alone can be right, and especially in the large store of information they furnish respecting the doctrine and discipline of the Early Church. We have in all 31 of his works extant, some of which may with tolerable certainty be assigned to his Orthodox and others to his Montanist period, *e.g.* to the former the *De Baptismo*, *De Pœnitentia*, and *De Præscriptione Hæreticorum*; to the latter, the *Adversus Marcionem*, *De Carne Christi*, and *Adversus Praxeam*. When, however, his celebrated *Apologia* was written will probably never be determined. Of the numerous editions published since 1521 the best are those by Leopold (4 vols. Leip. 1839-41) and Oehler (3 vols. Leip. 1853); and there is a good English translation in the *Ante-Nicene Library* (4 vols. 1868-70). See Maurice's *Lectures on the Ecclesiastical History of the 1st and 2d centuries* (Camb. 1854), Böhringer's *T.* (Stuttg. 1873), Hauck's *Tertullians Leben und Schriften* (Erlang. 1877), and Bonwetsch's *Die Schriften Tertullians, nach der Zeit ihrer Abfassung untersucht* (Bonn. 1878).

Tesch'en (Slav. *Cieszyn*), a town of Austrian Silesia, and the capital of the duchy of the same name, on the river Olsa, 18 miles S.E. of Oderburg by rail. It has two gymnasia with libraries (one Roman Catholic and the other Protestant), manufactures of cloth, leather, &c., one large flax-work and spinning-mill. Pop. (1870) 9779. The treaty between Maria Theresa and Friedrich II., which put an end to the War of the Bavarian Succession, was concluded here, May 13, 1779.

Tess'elated Pave'ment, a mosaic pavement composed of coloured Tesseræ (q. v.) arranged to form a regular pattern or a picture. T. P. was made by the ancients. Many examples of Roman workmanship have been brought to light in England and other localities. Theatrical and battle scenes exquisitely executed with coloured stones have been discovered at Pompeii.

Tess'eræ (plur. of Lat. *tessera*, 'a die or token') are small earthenware, marble, or glass tiles of geometrical form, used for tesselated pavements, ornamenting walls, &c.

Test Acts, the name given to two statutes of Car. II. which imposed certain oaths on the holders of public offices; the object being to ascertain if the person taking them was loyal, and of the Protestant religion. They were modified by 9 Geo. IV. cap. 17. The T. A. are now superseded by the oath of Abjuration (q. v.).

Tes'tament. See BIBLE.

Tes'tament (in law). See WILL.

Tes'ticle or **Tes'tis**, the name applied to the essential organ of the male reproductive apparatus. In higher animals the T. number two, and are enclosed in a *scrotum*, or sac of loose tissue, covered with skin. In some forms (*e.g.* whales and elephants) the T. are permanently retained within the abdomen, as indeed is the case with all animals below mammals; while in other mammals (*e.g.* Rodentia), again, the T. pass periodically at the breeding season from the abdomen into a temporary scrotum. In man the testicles are two oval bodies, suspended in the scrotum by the *spermatic cords*, which are attached to the hinder border of these organs. The average length of a T. is about 1½ or 2 inches, its weight averaging from 6 to 8 drachms. The left T. is larger than the right. The serous membrane covering the T. is the *tunica vaginalis*, the *tunica albuginea* is its fibrous investment, and the *tunica vasculosa*, consisting of a network of bloodvessels, serves as its vascular layer. The *structure* of the T. exhibits numerous *lobules*, variously estimated as existing to the number of 200 to 400 in each organ. The lobules consist of delicate *tubes* (*tubuli seminiferi*), which end in the *vasa recta*, a series of straight tubes, and these again terminate in from 12 to 20 small ducts, the *vasa efferentia*. The latter ducts end in the *epididymis*, which in its turn is continued to form the *vas deferens*, or excretory duct of the T., which opens into the urethra. The *seminal fluid* of the T. is secreted in the *tubules* of the T., and stored in the *seminal vesicles* situated at the base of the bladder.

Diseases of the T.—The most common disease of the testicle is *Hydrocele* (q. v.), a collection of fluid in the tunica vaginalis, the result of over-secretion or passive dropsy. *Encysted hydrocele* of the testicle consists in the formation of a cyst in contact with the testicle itself, and not with the cord, usually situated in the head of the epididymis, and containing a milky secretion. Mr. S. Osborn traces the development of these cysts to the 'hydatid of Morgagni,' a small cystic body which is always found between the testis and the globus major, and is the remnant of the Müllerian duct. The treatment is the same as that of common hydrocele. *Hæmatocele* (q. v.) is a collection of blood in the cavity of the tunica vaginalis which may be caused by a sprain or injury, or by spontaneous rupture of or exudation from some vessel in the lining of the sac. Hæmatocele has a more rounded shape than hydrocele, is heavier, less homogeneous, opaque, and is often accompanied by a dark colour of the scrotum. The treatment consists in laying open the tumour by a free crucial incision, removing the clots, arresting hæmorrhage by ligatures, and allowing the cavity to heal by granulation. *Orchitis* (q. v.) may be acute or chronic, and is frequently associated with tuberculosis. *Cystic* disease of the testicle is usually malignant, with one or more cysts in it; but there are cases of innocent tumour formed by a number of cysts. *Congenital tumours* may contain portions of bone and cartilage, and are probably cases of scrotal *inclusion*, or dermoid cystic tumours. Dr. M'Ewan, of Glasgow, removed a tumour of this kind in the Royal Infirmary, in 1877, containing hair, skin, fibrous tissue, cartilage, and bone, the structure consisting essentially of an independent development inclosed, and leading a parasitic life in the scrotum of the patient. *Enchondroma* of the testicle is generally associated with cystic disease, the cysts being dilatations of the tubuli seminiferi, depending on deposits therein. *Cancer* of the testicle is generally of the encephaloid variety, begins in the body of the gland, and contains large cysts and masses of cartilage. Cancer tends to spread up the cord, and

into the glands which lie around the aorta and common iliac arteries. Death then ensues either from pressure of the mass in the abdomen, or from its interference with digestion. See Curling's *Diseases of the Testis*, &c. (1878).

Testimo'nium is the clause of Attestation (q. v.), beginning 'In witness whereof.'

Tes'ting Clause, in a Scotch deed, is the clause by which its execution is authenticated. The name and designation of the writer, mention of the number of pages in the deed, and the names and designation of the witnesses, are statutory requisites to all deeds, unless Holograph (q. v.). In English law, see ATTESTATION, SIGNING, SEALING, and DELIVERY.

Testu'do (Lat. *testudo*, 'a tortoise'), in Roman warfare, an unbroken scale-like covering formed by foot-soldiers holding their shields horizontally over their heads, and designed as a protection from darts and other missiles. In an attack on a besieged fortress, a T. sloping gently from the first down to the last rank was invariably formed, and over this inclined platform other soldiers advanced to engage the enemy on the walls. A wheeled and covered machine which sheltered soldiers while working under the walls of a city was also known as a T.

Testu'do. See TORTOISE.

Tet'anus (Gr. *teinein*, 'to stretch'), or **Locked Jaw**, is an affection characterised by tonic spasms of the muscles, especially of the jaw, neck, back, and lower extremities, and is never attended by loss of consciousness. T. may be idiopathic or traumatic, and may be a condition at birth called *trismus nascentium*. The symptoms of T. may be ushered in by general discomfort, the patient being unable to masticate or swallow his food as usual; but the first decided symptoms noticed are stiffness of the neck, soreness of the throat, and a contraction of the jaws, which may become more complete within the fourth or fifth day of the affection. The features become pinched and set; the corners of the mouth are drawn upwards; the eyes are prominent, the brows are knit, and the hair and eyebrows are bristling, the whole constituting the *risus sardonicus*. The closure of the jaws is often so complete as to render it necessary to give food through small tubes or quills; and sometimes spasms of the pharyngeal muscles render swallowing impossible. The muscles of the back and lower extremities are convulsed, giving rise to *opisthotonos*, so that the patient's body describes an arc, the head and heels touching the surface on which he is lying, and the middle of the back being raised for some distance therefrom. Sometimes *emprosthotonos* ensues, the body being bent in the opposite direction; and, at other times, *pleurosthotonos*, when the muscles upon one side of the body are contracted. The pulse throughout is rapid and fluttering, the respiratory movements are irregular and catching; the dyspnœa is very distressing; the skin is dark; the face is haggard and depressed; there is profuse perspiration and a very marked elevation of temperature, which may rise as high as 110°. Death generally results from spasmodic closure of the glottis, or from exhaustion. Infantile T., or *trismus nascentium*, may appear from the first to the fifth day after birth, the symptoms being restlessness, trembling of the lower jaw, followed by spasms and rigidity of the muscles of the jaw, and the other symptoms of T. already described. The causes of T. are, exposure to damp and cold; accidents during parturition; punctured wounds; injuries in which there are crushing and mangling, such as railway accidents, and, occasionally, surgical operations. In certain regions there are apparently endemic influences, or modes of life, which seem to favour the origin of T., which is much more common in tropical than in temperate climates.

The morbid anatomy and pathology of T. is very obscure, and our knowledge is based almost entirely upon the experiments of physiologists. Dr. Lockhart Clark, however, in 1865 found, in six cases of T., that there was degeneration of the grey substance of the spinal cord; and Dr. James Tyson, in 1877, described two cases in which softening of the posterior columns occurred. In one of these cases there was extravasation of blood in the posterior columns; and, in the other, venous congestion. T. bears some resemblance to strychnine poisoning. The cases of death in cases of T., in the British army during the Crimean war, was 91 per cent., nearly the same as occurred in the French army under the first Napoleon. Dr. Joseph Jones, of New Orleans, in 1876 collected 480 cases of T., all of traumatic origin, and found that 213 recovered under treatment, the mortality being 49·2 per cent., or one death in 2·02.

Treatment.—The most efficacious remedial agents in the treatment of T. are chloroform, chloral hydrate, Indian hemp, Calabar bean, and conium. Calabar bean has been used with great success, and may be given in doses of from ¼ to ½ of a grain of the extract every two hours. The chloral treatment has been still more successful, and the chloral may be combined with Cannabis Indica and bromide of potassium. Chloroform subdues the symptoms temporarily, but is not curative. Cold to the spine, applied by the ether spray, has been recommended by Carpenter, and is probably the best mode of treatment.

Tête de Pont ('head of a bridge'), in fortification, a fieldwork, generally open at the gorge, with its flanks on the banks of a river. It is designed to cover one or more bridges.

Tetrago'neæ, a sub-order of *Ficoideæ*, including the apetalous plants of that order. Professor Lindley placed the same as a separate order near to *Chenopodiaceæ* under the name *Tetragoniaceæ*. The large type-genus *Tetragona* is chiefly S. African, with a few Japanese, Australian, New Zealand, and American species. *T. expansa* is a useful culinary vegetable known as New Zealand Spinach (q. v.), and *T. implexicoma* is serviceable in like manner.

Tetrahe'dron (Gr. *tetra*, from *tessera*, 'four,' and *hědra*, 'a side'), in geometry, is a regular solid, bounded by four equilateral triangles, so that when set upon any side it has the appearance of a triangular pyramid. In crystallography, the T. is regarded as a secondary form of the octahedron, from which it is derived by cutting away the alternate angles or edges.

Tet'rao. See GROUSE.

Te'trarch (Gr.), literally, the ruler of the fourth part of a country, in the later days of the Roman republic and under the empire, denoted, like ethnarch and phylarch, petty tributary kings. Thus the title was given to Herod the Great and his brother Phasael (Jos. *Ant.*, xiv. 13, 1), without reference to territorial divisions; although Herod's sons, Antipas and Philip, to whom the title is also applied (Luke iii. 1), did receive a fourth part of their father's possessions, and Archelaus as ethnarch got a half (Jos. *Ant.* xvii. 11, 4; *Bell. Jud.* ii. 6, 3).

Tetuan', a Spanish possession on the Mediterranean coast of Morocco, having an area of 914 sq. miles, and a pop. of 18,000. The town lies on the river Martil, four miles from its mouth, and is strongly fortified. Though accessible only to vessels of small size, T. has an active coasting and foreign trade in wool, silk, cotton, leather, oranges, and live stock. In 1877 there entered 181 vessels with cargoes of £29,630 value, and cleared 187 with cargoes of £10,244 value. T. was taken by Spain in 1860, and confirmed to that country by the Treaty of Madrid in 1861.

Tetz'el, Johann, preacher and seller of indulgences, was born about 1455 in Leipzig. He studied with some distinction at the university of his native town, and in 1489 entered the Dominican cloister of St. Paul there. He soon acquired a wide renown as a popular preacher, and in 1502 was commissioned from Rome to vend indulgences, a work so congenial to him that he made it the pursuit of his life. In 1516 he was appointed one of the officials to collect money by this means for the building of St. Peter's at Rome. His boldness and effrontery, his extravagant and immoral life, soon made his name notorious over the whole of central Europe, and there can be no doubt that the conduct of this accredited official of the Church did much to hasten the Reformation. It called Luther into the field. At last his ecclesiastical superiors became convinced of the harm he was doing. He was summoned before Miltitz, the papal legate, who severely condemned his conduct, and threatened him with punishment from Rome. In fear and dismay T. retired to his native town, where he died, as Luther has remarked, 'probably from the reproaches of his conscience and the Pope,' in July 1519. Lives of T. have been written by Gottfried Hechtius (Witt. 1717), Vogel (Leip. 1717-27), F. G. Hofmann (Leip. 1844). See Kayser, *Geschichtsquellen über T.* (Annab. 1877).

Teuth'idæ. See SQUID.

Teu'toburger Wald', a mountain-chain of Prussia, in the districts of Minden and Lippe-Detmold, which, beginning on the left bank of the Diemel, between Warburg and Stadberge (where it is named *Egge*), runs first N. then N.W., forming first the watershed between the Rhine and Weser, then between the Ems and Weser, and after reaching a total length of 110 miles, and a height of 1400 feet, ends at Bevergern, near the Ems, in Westphalia. The T. W. is noted for the destruction of the legions of Varus by Hermann in 10 A.D.

Teu'toni (Cicero, Livius, and Mela) or **Teu'tones** (Pliny), a German tribe, which, according to the accounts of Pytheas (q. v.), about 350 B.C. bought amber from the natives of the isle of 'Abalus,' and traded with the Greek colonies in S. Gaul. After this they settled on the Lower Elbe. They first appear in history after their migration to the Seine and alliance with the Cimbri, returning from Spain (103 B.C.). While the T. were proceeding to Italy along with the Keltic Ambrones, they were almost annihilated at Aquæ Sextæ by Marius (102), their king, Teutobod, being taken prisoner. See Müllenhof, *Deutsche Alterthumskunde* (vol. i. Berl. 1870).

Teuton'ic Knights', the last of the three great orders of religious knights which were founded in the Holy Land at the time of the Crusades, the two others being the Templars and the Knights of St. John. The full form of their title is the Order of the German (or Teutonic) Knights of the Hospital of St. Mary in Jerusalem; but they are often briefly designated as Kreuzherren or Knights of the Cross, and Marianer or Knights of St. Mary. It was at the siege of Acre in 1190 that the brotherhood took its rise under the patronage of Friedrich V., Duke of Swabia, as a brigade for the care of the sick and wounded, and it received papal sanction from Clement III. in 1191. The first master, Hermann (not Heinrich) Walpot of Bassenheim, built a church and hospital at Acre, and obtained from Pope Celestine the same privileges as were enjoyed by the two older orders; the third master, Hermann Barth, received considerable possessions in Hessia, and thus laid the basis of the German branch of the corporation; and under his great successor, Hermann of Salza, who was raised to the rank of prince of the empire, the wealth of the knights was enormously increased by donations of property in Austria, Thuringia, Treves, and elsewhere. The failure of the crusaders in Egypt turned the attention of the T. K. to Europe. At first they were invited by Andreas of Hungary to undertake the defence of the district of Burza in Transylvania against the Cumanians, but the king grew dissatisfied and expelled them again. The real field of their activity was destined to be in the N. On condition that they should be the bulwarks of Christendom against the still heathen Prussians, the country of Lobau and Kulm was bestowed upon them; and for the rest of their existence as a real confederation of warriors they were engaged in reclaiming the lands along the Baltic from the possession of Prussians, Poles, and Lithuanians. In 1237 they were strengthened by the incorporation of the Brethren of the Sword. On the loss of their possessions in Palestine by the fall of Acre in 1291, the central seat of their order was transferred to Venice, and in 1309, under the reign of the grandmaster Siegfried of Feuchtwangen, it was wisely removed to the castle of Marienburg, which had been founded in 1278. The purchase of the duchy of Pomerania, inclusive of Danzig, from the Markgrafs of Brandenburg in 1308, greatly advanced the prestige of the order, its wealth and influence continuing to increase during the following century. But in 1410 Ulrich of Jungingen, with an army of 80,000 men, suffered a terrible overthrow, in the battle of Tannenberg, at the hands of the Polish king Vratislav V., and from the blow thus struck the T. K. never recovered. Internal dissensions contributed to their decay, and at last, in 1525, Albrecht of Brandenburg, the grandmaster, not only agreed to recognise the superiority of the Polish crown over the Prussian territory of the order, but obtained from his new overlord the title of hereditary duke. It was in vain that the malcontents appealed to the empire, and secured the appointment of Walter of Kronberg to the office of grandmaster, and the removal of the seat of government to Mergentheim. The dissolution of the order was begun, and in the course of the century it rapidly advanced. In 1561 Gotthard of Kittler, the master of the Livonian province, surrendered Livonia to the King of Poland, and in the following year was rewarded with the title of Duke of Courland and Samgallen. The history of the T. K. had practically closed, for their German possessions were too small and scattered to secure them much political influence. The weak and wizened corporation was finally abolished in Germany by Napoleon in 1809; but it still exists with renovated vigour in Austria, where it received new statutes from Ferdinand I. in 1840, and has returned to the original task of taking care of the sick and wounded in war. A Netherland branch also still survives; for though it too was abolished by Napoleon, it was restored in 1815 by King William. The T. K. did invaluable service in the civilisation of N.-eastern Europe, for they not only knew how to subdue by the sword, but also how to discipline and educate the people under their sway. They founded cities, reclaimed much land from the sea and the wilderness, encouraged agriculture, suppressed piracy, and protected commerce. While they were at the height of their power they acted as the fathers of their subjects, and it was only when they were in sore straits themselves that they became reckless of the sufferings of others. The vast extent of the organisation rendered an elaborate system of subordination necessary. Every province was governed by a provincial master or commendator. Besides the grand master there were five great officials for the whole order—the grand commendator or treasurer, who also acted as vice grand master, the marshal-in-chief or head of the purely military department, the chief hospitaler or overseer of the sick, the chief master of the robes who looked after the supply of clothing, and the tressler or head of the financial department. There was summoned annually a general chapter of the order, and a special chapter in each province. See Voigt, *Geschichte des Deutschen Ritterordens* (Berl. 1857-59); Pfeiffer, *Deutsch Ordens Chronik* (Stutt. 1854), and Prutz, *Die Besitzungen des D. O. im Heiligen Lande* (Leip. 1877).

Teuton'ic Lan'guages, a subdivision of the great Indo-European or Aryan (q. v.) family of languages. The name Teutonic is derived from the Teutones, after whose conquest by Marius it came to be applied to all German-speaking people. Its origin is found in the Old High German *diot*, 'people, *duit-isc*, 'national,' the Old Eng. *theod* and *theodisc* (comp. Umbrian Lat. *tuticus*, from *tuta*, 'city'), of which the words *Deut-sch* and *Dutch* are modern forms. The T. L. are divided into three groups—(1) the Scandinavian (q. v.); (2) the Low German; (3) the High German (see GERMAN LANGUAGE). The Low German embraces Gothic (q. v.), the most primitive known Teutonic language, Platt-Deutsch (q. v.), Frisian (q. v.), Dutch (see NETHERLANDS), Flemish (q. v.), Old Saxon —spoken between the Rhine and Elbe, a specimen of which is extant in the *Heljand* (Old Eng. *Heiland*), '*Healer*' or 'Saviour,' a work of the 9th c.—and English (q. v.). See Jacob Grimm, *Deutsche Grammatik* (Gött. 1819 40); Max Müller's *Lectures* (1861-64); Schleicher, *Compendium der Vergleichenden Grammatik der Indo-German-Sprachen* (Weim. 1866); Helfenstein, *Comparative Grammar of the T. L.* (Lond. 1870).

Tewkes'bury, an old town of Gloucestershire, in the vale of Evesham, on the Avon, near its confluence with the Severn, 9 miles N.N.W. of Cheltenham by rail. It has a fine abbey church, founded by Robert Earl of Gloucester (died 1107), consecrated 1121, and restored 1875-77. The W. end and arches and the tower are in the Norman style of the period, but the pinnacles are regarded as later additions. T. has considerable trade in grain and live-stock, and the navigation hither has been improved of late years. Formerly noted for its mustard, T. now produces nails, hosiery, shoes, leather, &c. It returns one member to Parliament (two previous to 1867), and publishes two weekly newspapers. Pop. (1871) 5409. Although a place of great antiquity, T. is almost unknown in history before the foundation of the abbey. In its vicinity the Yorkists under Edward IV. and the Duke of Gloucester (afterwards Richard III.) gained a memorable victory over the Lancastrians, 4th May 1471. See Blunt's *T. Abbey* (Lond. 1877).

Tex'as (Ind. 'the hunting-ground'), a S.-western state of the American Union, more than twice the extent of the British Isles. Of very irregular outline, it is bounded N. by the Indian territory, from which it is partly separated by the Red River, on the E. by Louisiana and Arkansas, on the W. by the territory of New Mexico, in the S.E. by the Gulf of Mexico, and in the S. and S.W. by the Mexican republic, from which it is parted throughout by the Rio Grande. Area, 274,356 sq. miles; pop. (1870) 818,579,

of whom 564,700 were free coloured, and 724 Indians and Chinese. The state authorities estimated the pop. at 1,500,000 in 1875. T. is 800 miles in length from S.E. to N.W., and 750 in breadth, while its low, sandy coast-line, lined with sand-spits and lagoons, is nearly 400 miles long. The chief rivers, which all flow in a S.E. direction to the Gulf, are the Rio Grande, its affluent the Pecos, the Nueces, the Colorado, Brazos, Trinidad, and Sabine. The Red River leaves T. after following the northern boundary. The 'coast belt,' an alluvial strip from 40 to 60 miles wide, is partly barren waste, partly covered with thickets of cactus and chaparrals. Rich, rolling prairie extends further inland for upwards of 150 miles, covered here and there with forests of live-oak, pine, ash, elm, walnut, butternut, pecan, box, elder, and, towards the coast, magnolia, cypress, palmetto, &c. E. of Trinidad river T. is heavily timbered, but there are tracts cleared and cultivated, while the river-bottoms yield fine crops of cane, corn, cotton, &c. Beyond the prairie belt the land rises to about 1000 feet, has a rough broken surface, and affords excellent pasturage. Between the Colorado and Rio Grande there are many extensive sheepwalks and ranchos, where horses, mules, and cattle are raised in great numbers. In 1877 Captain King had 102,400 acres fenced in, and 50,000 head of cattle; to the W. of Corpus Cristo, Mr. Kennedy had an enclosed 'run' of 150,000 acres, containing a stock herd of 70,000. To the W. and N.W. the land rises to the *mesas* or arid plateaux of the Llano Estacado, where vegetation is scant and the only tree is the mesquite. Yet even here there is pasture enough for wild horses, buffaloes, &c. Further W. spurs of the Rocky Mountains enter T.—the Apache group, the Guadalupe Mountains, and other. The formations are chiefly Tertiary, Cretaceous, and Carboniferous; and the minerals comprise copper, iron, coal, galena, manganese, cobalt, nickel, bismuth, asphalt, gypsum, salt, saltpetre, antimony, potter's clay, mineral oils, soapstone, &c. The great bituminous coalfield, an outlying part of the Missouri field, has an area of 6000 sq. miles. The chief wild animals are the mustang, wolf, black bear, puma, jaguar, lynx, racoon, opossum, and peccary. The streams abound with fish, including black bass; and among the birds are the wild turkey, pheasant, quail, snipe, wild duck, vulture, pelican, heron, flamingo, and kingfisher. In 1875 there were 2,964,836 acres of improved land, and the value of live-stock (429,504 horses, 61,332 mules and asses, 3,182,904 cattle, 1,632,071 sheep, 1,202,445 hogs) was $38,888,734. The yield of wheat was 1,474,000 bushels; rye, 40,521; Indian corn, 28,016,000; oats, 1,118,000; barley, 63,000; sweet potatoes, 2,325,000; rice, 63,884 lbs.; tobacco, 59,706; cotton, 350,628 bales; wool, 1,251,318 lbs.; wine, 6216 gallons; cane molasses, 246,062 gallons; and honey, 275,164 lbs. The quality of cattle in T. is every year improving, and their price has nearly doubled since the exportation of beef to England began. Sheep-rearing is also on the increase, and of late many English and Scotch as well as American breeders have entered the business. The principal industries are lumbering, meat-packing, and cotton-making; and there are also coal and copper mines, smelting-furnaces, and salt-works. In 1875, T. had 1540 miles of railways; and in the year ending May 31, 1878, the T. and Pacific Railway brought into T. 5674 first-class passengers and 27,718 immigrants. Austin is the capital, and Galveston (q. v.) the chief seaport; larger towns yet are Houston and San Antonio. T. belonged to Mexico till 1835, when the settlers under Sam Houston (q. v.) formed it into an independent republic, which was defended successfully against Santa Anna (q. v.) in the battle of San Jacinto (21st April). It was voluntarily annexed to the United States in 1845, and its invasion by the Mexicans led to the war of 1846-47. In the Secession war it joined the Confederacy, and was the last state to surrender. It was under military command till 1869, and adopted a new constitution in 1876. See Baker's *History of T.* (New York 1873), and a Report on T., contributed to the *Times* of 3d January 1878.

Tex'el, an island of N. Holland, at the entrance to the Zuider Zee, is separated from the Helder by the Marsdiep, which is defended by a fort (Oude Schan). Area, 83 sq. miles; pop. (1876) 6260. It is partly girt with dykes, partly with dunes, and its rich pasture supports some 34,000 sheep, which yield, besides about 200,000 lbs. yearly of fine wool, the famous green cheese known as Texeler Schafkäse. Eijerland ('egg land') in the N. is visited by myriads of sea-fowl for the purpose of breeding. T. has two harbours. Along its coast have taken place many famous sea-fights.

Tezcu'co ('place of detention'), a lake of Mexico, the largest of four which cover a considerable part of the circular valley that contains the city of Mexico. Area, 77 sq. miles. It occasionally overflows its banks and inundates the streets of Mexico, which are only 3½ feet above its ordinary level. The town of T. stands on the shores of this lake 16 miles N.E. of Mexico. It is now much decayed, and its pop. is only about 5000.

Thackeray, William Makepeace, great-grandson of Archdeacon T., head-master of Harrow (1746-60), and grandson of a member of the E. Indian Council, was born at Calcutta, 12th August 1811. His father, Richmond T., also a civil servant, died in 1815, and two years later the boy was sent home to England; the ship touched at St. Helena, and he saw the Corsican ogre, who ate three sheep a day, and as many children as he could catch. At Charterhouse (1822-28) the battle and bravo sketches of T. ranked higher than those of his younger schoolmate Leech; at Trinity College, Cambridge, he was the friend of Tennyson, Kemble, John Sterling, and Monckton Milnes, and edited the motley, short-lived *Snob* (1829). Cambridge he left without a degree, and thinking to make art his calling, studied in 1831 at Weimar, 'the dear little Saxon town where Goethe lived,' anon at Rome, lastly at Paris under Bonington. Exchanging brush for pen, he furnished as editor the weekly *National Standard* (1833-34) with stories, verses, and woodcuts, published *Flore et Zephyr, Ballet Mythologique* (Lond. and Par. 1836), and sunk what was left out of Richmond T.'s savings in his stepfather's daily, the *Constitutional and Public Ledger* (1836-37). This loss and his marriage with a dowerless wife made letters thenceforth a hard necessity, and besides writing for the *Examiner, Times*, and *Westminster*, he contributed to *Fraser* (1837-44) the *Yellowplush Correspondence, Catherine, Shabby Genteel Story* (broken off by a heavy domestic sorrow), *Great Hoggarty Diamond, Fitz Boodle Papers, Little Travels*, and *Barry Lyndon*. The *Bedford Row Conspiracy* and *Major Gahagan* appeared in the *New Monthly* (1838-40), in *Punch* (1841-50) the *Ballads of Policeman X, Snob Papers, Jeames's Diary*, and *Novels by Eminent Hands*; while the *Paris Sketch-Book* (1840), *Irish Sketch-Book* (1843), *Journey from Cornhill to Grand Cairo* (1846), and *Mrs. Perkins's Ball* (Christmas 1846), were issued as independent works. Now we can mark the steady growth of T.'s powers, and even in 1841 Sterling pronounced his *Hoggarty Diamond* as good as anything in Fielding or Goldsmith; but the world at large was just inquiring who 'Michael Angelo Titmarsh' might be, when *Vanity Fair*, rejected of magazines, came forth in monthly parts (1847-48), and before its close established its author's name. His brilliant success in London, the provinces, and America as lecturer on the *English Humorists of the 18th c.* (1851-52), and the *Four Georges* (1855-56), his defeat at the Oxford elections as Cardwell's Radical opponent (1857), the starting and editorship of the *Cornhill Magazine* (1860-62)—these were the chief events of T.'s prosperous years. Their fruits were five more of his *Christmas Books* (1847-55), *Pendennis* (1850), *Esmond* (1852), *The Newcomes* (1855), *Virginians* (1859), *Lovel the Widower* (1861), *Philip* (1862), *Roundabout Papers* (1862), and *Denis Duval*, the fragment written, like its three predecessors, for the *Cornhill's* pages. A rich man now, he had lately removed to his favourite 'Old Court Suburb' near Kensington Palace, when on the Christmas Eve of 1863 the Master at midnight called, and T. answered *Adsum*. He is buried at Kensal Green; Poets' Corner contains his bust. The sterling merit of T.'s novels lies in their absolute truth to nature. He wrote of nothing that he did not know, and in the 'Grey Friars' and 'Oxbridge' of Clive and Pendennis we see his own school and university, in 'Pumpernickel' the Weimar court, in 'Clavering' his stepfather's Devonshire residence, Ottery St. Mary; just as his pictures of Anglo-Indian and literary life, his delineations of last century presented in *Esmond* and the *Virginians*, in the *Lectures* and *Denis Duval*, are the outcome of keen personal observation or of loving, laborious study. His heroes and heroines are often weak, his scoundrels never without redeeming qualities, the reason being that T. recognised no race of Admirable Creightons, had met no villains wholly villanous. Of plot there is just so much or little as in everyday life; the events and characters evolve themselves. The reappearance of Beatrix, beautiful as heartless, as the Baroness

Bernstein, fat and worldly, is perfectly consistent and intelligible; while Esmond's marriage with Lady Castlewood is justified by the author's answer to a friend's remonstrance: 'I didn't make him do it; they did it themselves.' So true himself, he hated all lying, pretence, and shams; and snobbery, alike of high and low, was mirrored by him in all its loathliness. And we, offended by the too-faithful mirror, have likened it to the hob-goblins in Andersen's story, and branded T. with the name of cynic. He a cynic, the creator of Esmond and Warrington, of Helen and Colonel Newcome, the tender monitor of Philip and Pendennis, of all his brother men! we his accusers, fearing ourselves the charge—'Thou art the man, not Steyne, or Becky, or Barnes'! Interpret these books by their author's life, its ceaseless charity and boundless faith, and he stands revealed as the great Humorist Preacher, in genius equal, in largeness of soul superior, to Fielding. His drawings, too hasty to be faultless, but vigorous always, often beautiful, have been in part collected by his daughter in the *Orphan of Pimlico and Other Sketches* (Lond. 1876); for his Life we have only brief monographs by Hannay (Lond. 1864) and Theodore Taylor (Lond. 1864), with articles in the *North British* (February 1864), *Edinburgh* (January 1873), &c. A Life, however, by Anthony Trollope, is announced for publication in the *Men of Letters* series (February 1879).—**Anne Isabella T.**, born about 1839, ranks high among living novelists by her contributions to the *Cornhill.* These, as republished, include the *Story of Elizabeth* (1863), *Village on the Cliff* (1867), *Five Old Friends and a Young Prince* (1868), *To Esther, and Other Sketches* (1869), *Old Kensington* (1873), *Bluebeard's Keys* (1874), *Toilers and Spinsters* (1874), and *Miss Angel* (1875), the last being founded on Angelica Kaufmann's life. Tender and harmonious, her stories—and specially the recasts of world-old folktales—remind one of Birket Foster's pictures, with their exquisite backgrounds; like her father's, they depend not for interest on intricate plot, and through them flows a quiet undercurrent of subtle, subjective thought.

Thalamiflo'ræ, a subdivision of dicotyledonous plants, including all those orders in which the majority of genera have distinct petals, inserted with the stamens on the receptacle under or around the ovary.

Thalassicollida, a group of *Protozoa* (q. v.) belonging to the order *Radiolaria* (q. v.), and closely allied to Foraminifera and other *Rhizopoda*. They have structureless cysts, and give off processes resembling rays, and which may unite so as to form a network. The T. exist as simple or compound organisms.

Thal'berg, Sigismund, a composer and a great master of the pianoforte, was born at Geneva, January 7, 1812. He studied under Hummel at Vienna, Pixis at Paris, and Moscheles at London, after which he devoted himself entirely to the pianoforte. Probably no performer ever produced such orchestra-like effects as characterised T.'s style of playing. He had extraordinary power in his wrists and flexibility in his fingers, which enabled him to produce results equal to those obtained by four ordinary hands, and his style was remarkable for brilliancy and elasticity. He composed numerous compositions for the pianoforte, the most popular of which is perhaps his well-known variations on *Home, Sweet Home.* He died 27th April 1871. T. married a daughter of Lablache, and his own daughter, Mademoiselle Zare T., has appeared with success during the last few seasons at the Royal Italian Opera, Covent Garden.

Thalei'a (Gr. 'blooming'), one of the nine Muses (q. v.), who in later times was regarded as the patroness of comedy and banquets.

Thal'er, a German coin worth about three shillings of English money. It is going out of use. See DOLLAR, and MARK.

Tha'les, of Miletus, an early Greek philosopher, and one of the Seven Wise Men (q.v.), was born about 640 and died about 546 B.C. His theory of the universe was—Water is the cause and first or original ground of all things; everything comes from it; to it everything returns. T. was the first Greek who, as Aristotle remarked, sought a reasoned explanation of the universe. He was celebrated in antiquity, not only as a philosopher, but as an astronomer and politician.

Thall'ium (Tl = 204), a metallic element, was discovered by Crookes in 1861. While examining the spectrum obtained by holding in the flame of a Bunsen burner the residue of the iron pyrites which are deposited in the flues of a sulphuric-acid chamber, he observed a green line which was not referable to any known substance, and which he then traced to its source. T. occurs most abundantly in copper and iron pyrites, and is a soft nearly white metal tarnishing quickly in the air. It closely resembles lead in its physical properties, melts at 294° C., and volatilises at a red heat. It forms two oxides the thallous (Tl_2O) and thallic (Tl_2O_3), the former of which is very soluble in water, is distinctly alkaline, and reacts in the same manner as caustic potash. The thallic oxide is a dark-red insoluble powder, and is reduced by heats to thallous oxide. Both these oxides give rise to a series of salts, the thallous salts being the more stable. The salts of T., like those of lead, are poisonous.

Thallo'genous Plants, Thall'ogens, or **Thall'ophy'tes**, are names applied to leafless cellular cryptogams, *i.e.*, to plants which have no flowers, no leaves, no axis, no vascular tissue, but are constructed of cells only. To this division belong Algæ, Fungi, and Lichens. It is impossible to draw strict lines of demarcation between these three classes. Hepaticæ (q. v.) form a transition from T. to Acrogens (q. v.).

Thall'us (Gr. 'a frond'), in botany, implies the fusion of root, stem, and leaves into one general mass. The term is used to express that part of Thallogenous Plants (q. v.) immediately bearing the fructification, but is more especially applied to the whole vegetative system of Lichens (q. v.), in which three types of structure of T. may be distinguished—the stratified, the pictorial, and the gelatinous. The T. in fungi consists of two principal parts, the mycelium and the receptacle or stroma, the latter being as a rule the conspicuous part, and in the mushroom, for instance, popularly regarded as the whole fungus. In ferns and some mosses the spore on germinating gives rise to a thalloid leaf-like structure called the *prothallium* or pro-embryo.

Thames (Celtic *Tamh*, 'quiet'), the longest river in England, and perhaps the most important and picturesque in Great Britain, has a length of 210 miles, and a drainage area of over 6000 sq. miles. It is formed at Lechlade in Gloucestershire, by the confluence of the Churn (with its tributaries the T. Head and Key), Leach, Colne, &c., from the Cotswold Hills, and the Cole from the S. After flowing E. for 12 miles, it takes a northerly bend, receiving on the left the Windrush and Evenlode. Turning to the S. E. it passes Oxford, and is joined by the Cherwell, the Ock (at Abingdon), the Thame and the Kennet (at Reading), then keeping more directly to the E., by the Loddon, Wey, Mole, Wandle, Darrent, and Medway from the S., and by the Coln, Brent, New River, Lea, and Roding from the N. The chief places on its lower course are Windsor, Eton, Richmond, London, Greenwich, Woolwich, and Gravesend, below which the river expands into an estuary, widening till it enters the North Sea at the Nore (q.v.), opposite Sheerness. Alone of the larger English rivers, the T. forms nearly throughout its course a boundary between counties—Wilts, Oxford, Buckingham, Middlesex, and Essex; Kent, Surrey, and Berks. It is tidal to Teddington, 19 miles above London Bridge, and at this point 380,000,000 gallons flow over the weir every 24 hours. At high tide the T. is 250 feet wide here, while at London Bridge, 45 miles from the Nore, it is 800 feet wide and 30 feet deep. Its width at Woolwich is 490 yards, at Gravesend 800 yards, and at the Nore Light 6 miles. It is navigable for barges to Lechlade (200 miles), for ships of 800 tons to St. Catharine's Docks, near London Bridge, and for vessels of 1400 tons to Blackwall, below the Isle of Dogs. At London (q. v.) the T. is crossed by 15 bridges, and it is lined by magnificent Embankments, extending on the N. from Blackfriars to Westminster, and from Albert Bridge to Chelsea Hospital; and on the S. from Westminster to Lambeth. These Embankments, together with the splendid new approaches from Charing Cross and the City, were constructed at a cost of over £4,000,000. Although the T. does not form a true delta, it carries down large quantities of mud, which in its lower 'reaches' or bends give it a proverbial turpidity. This mud is systematically dredged and removed to prevent obstruction. See Mrs. Hall's *Book of the T.* (Lond. 1869), and Huxley's *Physiography* (Lond. 1877).

Thane, or **Thegn** (Old Eng. *thegnian*, 'to serve;' *cf.* Ger. *dienen*), the title originally of the servants of kings and ealdormen, who, as a new kind of nobility attached to their order, gradually superseded the older eorls. The 'dish-T.', 'horse-T.', and 'bower-T.' became great officers of state; the name of T.

was used synonymously with 'gentle,' and with the growth of the kingly power the king's thegns rose to the highest rank of gentry, those of ealdormen and bishops forming an inferior class. In its turn the native thegnhood was thrust down at the Conquest to a secondary place, and the title was displaced by those of tenant-in-chief, of knight, and gentleman. See NOBILITY; also Freeman's *Comparative Politics* (1873), and *History of the Norman Conquest* (1870-76).

Than'et, the N.E. portion of the county of Kent, England, is separated from the rest of the county by the Stour, and is bounded on the N. and E. by the German Ocean. The length is 10 miles, its breadth increasing from 3 in the W. to 8 in the E. The geological formations are mostly recent; chalk abounds, and forms cliffs around the coast. Of the 26,600 acres 93 per cent. are under cultivation. Margate and Westgate on the N., Ramsgate and Broadstairs on the E., are favourite watering-places with the Londoners. The N.E. corner forms the N. Foreland, with a famous lighthouse. Pop. (1871) 42,129. A few marshes are all that now represent the Wantsum or waterway which at one time separated T. from the mainland. It is still easy to discover, in the misty level of Minster Marsh, traces of the channel by which the first English invaders of Britain approached the gravel-spit of Ebbsfleet.

Thann, a town of Elsass-Lothringen, on the Thur, at the entrance of the St. Amarinthal, 11½ miles N.W. of Mulhausen by rail. The church of St. Theobald (1455-1516), with an elegant pierced spire 266 feet high, is richly and tastefully decorated. T. contains several thriving cotton and silk factories, machine-works, foundries, &c. Pop. (1875) 7532.

Tha'sos, a Turkish island in the Ægean Sea, off the coast of Thrace, 3½ miles from the mouth of the Karasu or Mesta. Area 85 sq. miles; pop. about 7000, mostly Greeks. It is covered with mountains, the highest of which, Mount Ips-ario, rises to a height of 3428 feet. Cultivated spots of extraordinary fertility occur near the seashore, and wine, oil, honey, maize, and timber are largely exported. In ancient times productive gold mines were worked in the island.

The'a. See TEA.

The'atines were a religious order which was founded in the Roman Catholic Church in the 16th c., in the attempt to introduce among the regular clergy that reform which was universally felt to be deeply needed in all the institutions of the hierarchy, of which feeling the Protestant Reformation was only a peculiar outcome. The society was founded by John Peter Caraffa, afterwards Pope Paul IV., then Bishop of Chieti or Theate (whence the name T.), and Cajetan de Thiene, who, along with other two friends, assumed the usual vows of poverty, chastity, and obedience, September 14, 1524. Being properly only regular clergy with the vows of monks, they did not adopt any peculiar dress. Their intention was to establish a seminary for the priesthood, and their prescribed clerical duties were preaching, administration of the sacraments, and care of the sick. As the founders were of noble birth, the T. came to be considered the order of priests peculiar to the nobility. The order soon spread over Italy, then into Spain, Poland, and Germany, and in the 17th c. into France. See Helyot, *Hist. des Ordres Religieuses*.

The'atre (Gr. *theatron*, from *theaomai* = 'I see') means literally any building used for purposes of public exhibition, but is now commonly restricted to buildings approaching more or less nearly to a semicircular form, whether used for lectures, anatomical or chemical demonstrations, or dramatic performances. In general conversation the word is applied almost exclusively to the last-mentioned class. The T. of the Greeks and Romans differed in many important respects from the modern T. The nature of the Greek drama (see DRAMA) as a universally popular, semi-religious institution, led to the construction of theatres immensely larger than any which have been attempted in modern times. It is calculated that the T. at Epidaurus contained seats for 16,000 spectators, that of Syracuse for 22,000, and that of Megalopolis for 44,000. The enormous size of the auditoriums, combined with the tendencies derived from its religious origin, gave to the Greek tragedy a statuesque and almost operatic character, which reacted on the form and arrangements of the stage, making it much simpler than the complicated structure of elaborate mechanism which the modern drama demands. The Greek T., then, was composed of three parts—the *theatron* or *koilon* (*i.e.*, the auditorium); the *orchestra*, analogous in position to our stalls and pit, but occupied not by spectators but by the *choros*; and the *skēnē* or stage, where the actual performances were conducted. The *theatron* was composed of concentric rows of semicircular stone seats rising above each other like a flight of stairs. In some of the Greek theatres the arc was larger than a semicircle. It was never roofed, but in some of the later theatres arrangements were made by which an awning could be drawn over in case of need. The Greek T. was almost invariably placed in some natural hollow, where the architect was assisted by the form of the ground. The Romans, on the other hand, generally built their theatres on flat ground. An inner semicircle concentric with the curve of the *theatron*, and making, as it were, the bottom of the basin, formed the *orchestra*. In it, probably at the exact centre of the whole building, was situated the *thymelē*, or altar of Dionysus. In it, too, were the 'Charonic steps' by which spirits ascended. Two *parodoi* or passages, one on each side, led into the *orchestra* from the exterior of the building, and separated the *skēnē* from the *theatron*. By these, messengers and persons supposed to come from abroad arrived, and ascended the *skēnē* from the *orchestra* by means of steps. In the Roman theatres the spectators encroached upon the *orchestra*, which became the place of honour. The *skēnē* in the Greek T. never occupied the full diameter of the semicircle, as it did in the modified Roman form, but left open a space at each side through which the spectators could command a view of the surrounding scenery, which was always taken into account in the selection of a site. The *skēnē* consisted of a flat two or three storied building, with a wing projecting at each side, and thus enclosing an open platform, the *logeion* (Lat. *pulpitum*) or stage proper, raised considerably above the *orchestra*. The *logeion* and its back wall, which was pierced by three entrance-doors, were called the *proskēnion*, and the wings, in each of which there was also an entrance-door, were called *paraskēnia*, forming the green-rooms, dressing-rooms, property-rooms, &c., of the T. In some Greek and most Roman theatres the stage could be screened by a curtain, which, however, rose from below instead of falling from above the *proskēnion*. Though there was little need for changes of scene in the Greek drama, the *skēnē* probably afforded greater facilities for variety of decoration than is sometimes supposed. At either side of the *logeion* was a three-sided revolving pillar—a prism—on each face of which was represented a different decoration, so that provision was made for three different 'wings,' as they would be called in a modern T. The *proskēnion*, too, could be made to represent a palace, temple, or other building at will, and the machinery by which the *Deus ex machinâ* made his descent, or the hero was wafted to Olympus, though its construction has not been thoroughly ascertained, must have been elaborate. Acoustic properties were necessarily thoroughly studied, and the resonance given to the actors' voices by their brazen masks was assisted by arrangements which, in the absence of a precise knowledge of their nature, we may call sounding-boards, fixed in the seats throughout the auditorium. The theatres at Aspendus, Egesta, and Patara are among the finest existing examples of the Greek T., and those of Orange in the S. of France, of Pompeii, and of Herculaneum, are perhaps the best examples of the Roman T. See Genelli's *Das T. zu Athen* (Ber. 1818); Ferrario's *Storia e Descrizione de principali Teatri antichi e moderni* (Milan 1830); Donaldson's *T. of the Greeks* (7th ed. Lond. 1860); Geppert's *Die Altgriechische Bühne* (Leip. 1843); Schonborn's *Die Skene der Hellenen* (Berl. 1861); Becker's *Charicles* (2d ed. Lond. 1854); Strack's *Das Altgriechische Theatergebäude* (Potsdam 1843); and Arnold's *Altrömische Theatergebäude* (Leip. 1873).

Throughout the Middle Ages, the drama, such as it was, had for its sole machinery two or three storied scaffolds erected in cathedrals, monasteries, or baronial halls, to represent heaven, earth, and the regions below, as required by the popular mysteries and moralities of the day. With the revival of learning came a revival of the drama, and specially-constructed buildings began to be set apart for dramatic representations. The earliest Italian theatres—those by Bramante in the Vatican, by Palladio at Vicenza (1580), and by Alcotti at Parma (1618)—were designed on the ancient model, though on a much smaller scale. In England, France, and Germany, the earliest dramatic representations, properly so called, took place either in booths, or in

tennis-courts and inn-yards. The form of the theatres with which we are now familiar, with from two to five or six tiers of seats, was perhaps suggested by the old inn-courtyard with its galleries. To give an idea of a T. of Shakespeare's time we cannot do better than condense the description given by Mr. W. Lloyd of the Globe in Bankside :—'The internal galleries were protected by a roof of which the eaves sloped outwards only, while the central pit or yard was open to the sky, and the portion of the octagon that was occupied by the stage and tiring-rooms was covered. The foppish custom of privileged spectators sitting on the stage on stools, with pages attendant, was a source of standing annoyance to the general audience. The curtains in front of the stage ran upon a rod and opened in the centre, and the stage itself seems to have had an enclosure or arras, answering the purpose of our side-scenes; towards the back, where they were called traverses, they could be drawn and undrawn as required. In the centre of the stage at the back was a secondary stage, more or less permanent. The break of level was supposed to account for any distance of perspective, and thus a double action might proceed on the stage at once. [This secondary stage formed indifferently the ramparts of a castle or the heights of a battle-field, Mark Antony's rostrum, Juliet's balcony, or the stage for Hamlet's players.] In the way of scenery, the utmost that was attempted seems to have been to put such fixed properties on and about the stage as would suggest the scene required. Tombs, rocks, hell-mouths, steeples, beacons, and trees are found in lists of properties. There were devices for counterfeiting thunder and lightning, for exhibiting the sun breaking through a cloud, &c. Graves and trap-doors, ascents to and descents from heaven, were also provided for. The stage was strewn with rushes, and on occasion, by excess of refinement, it was matted. The band of eight or ten performers is supposed to have sat in an upper balcony over what is now called the stage-box.' It remains to be said that changes of scene were generally effected simply by putting up a placard announcing what the stage was supposed to represent; that the dresses were rich and often extravagant; and that until the Restoration female parts were uniformly taken by boys or young men.

Movable scenery, first introduced in Italy by Balthazar Sienna in 1553, and to some extent perfected by Bibbiena in Italy so early as 1657, led to a revolution alike in dramatic literature and in theatrical construction. Inigo Jones, in the masques which he invented along with Jonson, Carew, and Davenant, seems to have carried stage mechanism to considerable perfection; but it was not until after the Restoration that movable scenery, as we at present know it, was practically utilised upon the stage. Since then, scenic art has become more and more elaborate, until at several periods, and perhaps never more than at the present day, it has threatened to swallow up dramatic art and to make of the T. an exaggerated panorama. Theatrical construction has attracted the attention of almost all the greatest architects of the last two centuries, but except in details of comfort it can scarcely be said that much progress has been made since the first elliptical or horse-shoe theatres with ascending tiers were constructed in Italy early in the 17th c. The desiderata of a perfect T. are four in number—(1) That the whole stage shall be seen from all parts of the auditorium; (2) that what passes on the stage shall be distinctly heard throughout the auditorium; (3) that the ventilation of the auditorium shall be perfect; (4) that there shall be adequate provision for comfortable ingress and rapid egress. In no single T., it is probable, have all these conditions been fulfilled. An elongated form of auditorium is said to be the most advantageous acoustically speaking, and it has therefore been generally adopted in opera-houses. On the other hand, there can be no doubt that, for seeing, a form approaching as nearly as possible to a semicircle is the best, but this can, of course, only be adopted in moderate-sized theatres, where the width of the stage may bear a large proportion to the curve of the auditorium. The theatres and opera-houses of the Continent, where the drama is state-supported, stand, as a rule, on open spaces of ground, and have handsome corridors, staircases, crush-rooms, *foyers*, *loggias*, &c., while their external architecture is often extremely handsome. In England, on the other hand, theatres are generally squeezed in between the houses of crowded thoroughfares upon small plots of extremely valuable ground, greatly to the detriment not only of their beauty but of their convenience and safety.

The stage of a great modern T. is a huge piece of mechanism, inconceivable to those who have not seen it, incomprehensible to those who have not practically studied it. Let us imagine ourselves standing close to the *footlights*, now generally sunk in a deep groove and provided with movable screens of different coloured glass so as to represent moonlight and other atmospheric effects. The curtain is up, and we are looking towards the back of the great sloping platform. It may be that almost the whole stage is shut off by a *flat* scene, placed in the foremost grooves, or by a *cloth*, a great piece of painted canvas let down from above. In the angle of the proscenium, probably to our right, sits the *prompter* at his little table, his *scene-plot* before him, and his apparatus of bells and gas-regulating cranks close at his hand. The opposite side of the stage is called the *O P*, and both are lighted by spiral lines of gas jets called *gas wings* or *ladders*, while the rows of gas jets suspended above the proscenium, and lighting the stage from above as the footlights do from below, are called the *gas battens*. At a sound of the prompter's bell the cloth rises or the flat is slid off, and we find behind it a great *set-scene*. It may be a carpeted room, with walls, doors, windows, handsome furniture, a modern fire-place, a painted ceiling, &c., as complete and apparently as real as in the most luxurious dwelling-house; or it may be a landscape, the background filled up with a great painted *frame*, and the sides occupied by narrow scenes called *wings*, representing trees, houses, &c., while the top of the stage is draped with slips of canvas called *soffits* and *borders*, which may either represent the sky or a mass of overhanging foliage. Looking up, we can see the scene-shifters and gas-men among their wildernesses of ropes and pullies in the great lateral galleries called *flies*, but we cannot see the *barrel loft* in which are placed the drums and windlasses by which the curtains, cloths, and heavy pieces of scenery are worked. The stage, we may note, is covered with marks which show the situation of the *square traps* and *star-traps* by which performers can descend into regions below—technically the *well*—or be shot up from the depths by means of an elaborate system of weights and pulleys. Whole pieces of scenery, too, can be raised and lowered through the stage by means of the *bridges* working in great transverse openings. If we penetrate behind the frame at the back we shall probably find ourselves in the *scene dock*, or place for storing scenery when not in use. Above this in many theatres is the *painting room*, the domain of the scenic artist, while on every side is a labyrinth of dressing-rooms, property-rooms, and offices of every description up to the green-room and the sanctum of the manager himself. The reader who wishes to be initiated into all the mysteries of scenic effect in their most recent developments may study M. Moynet's elaborate treatise, *L'Envers du T.*, *Machines et Décorations* (Par. 1875).

Among the most famous, architecturally speaking, of Continental theatres are the San Carlo at Naples, the Scala at Milan, the Fenice at Venice, the Vienna and Berlin opera-houses, the court theatres of München and Dresden, the Town T. of Frankfurt, the Royal T. of Copenhagen, and the Bourdeaux T. Unquestionably the most magnificent T. the world has ever seen is the Nouvel Opéra of Paris, on which over a million pounds have been lavished. It covers 2·65 acres of ground, while Covent Garden covers only 0·70, La Scala and the San Carlo 0·90 each, and the Carlo Felice, Genoa, 1 acre. On the other hand, its auditorium will only seat 2156 persons, while Covent Garden seats 2500, La Scala and the San Carlo 3000 each, and Drury Lane 3060. Its artistic merits have been severely criticised, but of its gorgeousness there can be no doubt. A novelty in theatrical construction is the great Opera-T. at Bayreuth, built (1877) under the direction of the composer Wagner, specially for the performance of his operas. The scheme for a great National Opera House in London has apparently fallen through, as was indeed only to be expected of such a gigantic private enterprise. The following is a list of some of the principal theatres which have been erected in London since the beginning of the English drama in the reign of Elizabeth :—The T. in Shoreditch (1576-1598); the Curtain, also in Shoreditch (1577-1623); the Blackfriars* (1576-1647); Paris Garden, Southwark, also used for bear-baiting (1544-1647); the Whitefriars (1580-1612), rebuilt as the Salisbury Court T. (1629), called in 1660 the Dorset Court T.;

* Some very recent researches by Mr. Halliwell-Phillips tend to show that the Blackfriars T. was not founded until several years later than the date given above.

the Fortune, in Golden Lane (built 1599, burnt 1621, rebuilt 1623, pulled down 1661); the Globe (1593–1647, burnt 1613), in Bankside (where were also the Rose, Hope, Swan, and Newington Butts Theatres); the Cockpit or Phœnix in Drury Lane (1616–1662); Drury Lane T. (opened 1663, burnt 1672, rebuilt by Sir Christopher Wren 1674, again rebuilt 1794, burnt 1809, rebuilt by Wyatt 1812); the Haymarket T. (built 1702, rebuilt 1767, again rebuilt 1821); Covent Garden T. (opened 1732, burnt 1808, again burnt 1856, rebuilt by Barry 1858); Italian Opera House, Haymarket (opened 1705, burnt 1789, again burnt 1867, reopened as Her Majesty's T. 1878); Lyceum T. (built as English Opera House 1795, burnt 1830, rebuilt 1834), Adelphi T. (1806), Olympic T. (1806, burnt 1849), Strand (1831), Princess's T. (1840), Royalty T. (1863), Prince of Wales T. (1865), Globe T. (1868), Gaiety T. (1868), Charing Cross T., now Folly T. (1869), Vaudeville T. (1870), Court T. (1871), Criterion T. (1874). London possesses in all (1879) 57 theatres capable of seating 126,100 persons, but among the largest of these are the Transpontine and East-End theatres, where melodrama and pantomime furnish almost the whole repertoire. The first T. in Dublin was built in 1635, and the first Edinburgh T. in 1672. The theatres of many provincial towns—such as Liverpool, Manchester, Birmingham, and Glasgow—now rival the metropolitan houses both in size and splendour of decoration. There has of late years been a marked revival of interest in theatrical amusements on the part of the British public, accompanied by an improvement, slight, but still noticeable, in dramatic art itself. Still the state of things cannot be regarded as in any respect satisfactory. Public taste is undoubtedly low, and it will necessarily remain so as long as there is no single T. which can afford, for however short a time, to disregard it, or rather to attempt to raise it. We have no school of dramatic training. Our actors pick up their professional education at hap-hazard. The preference of the public too often tempts them to follow the worst rather than the best models. The system of long runs seems carefully calculated to ruin even the most promising artists. And finally the conditions of dramatic enterprise are such that our native playwrights have scarcely a chance to develop their talents, and the stage is overrun with adaptations from the French, in which unquestionable dramatic skill is too often combined with very questionable morality. The proposal to remedy this state of affairs by means of an endowed T.—whether endowed by Government or by private generosity—is generally met with ridicule, and is certainly not likely to be soon adopted. In it, however, lies the sole remedy for the evil. If it is impracticable, the evil is irremediable. The immeasurable superiority of French acting—a superiority which no one disputes—is often attributed to a greater natural aptitude for dramatic art on the part of the French as a people. The nation which can set Garrick, Kean, and Mrs. Siddons against Lekain, Talma, and Rachel, should be slow to admit any such natural advantage. A more rational explanation lies ready to hand in the fact that the French possess a T.—the Théâtre Français—which is, and has been for nearly two centuries, independent of immediate popular favour, which can afford to educate public taste, which provides for dramatic aspirants adequate and systematic training, which attracts to itself the very highest dramatic talent of the country by assuring to its *sociétaires* a handsome competence while at work and a handsome pension on retirement, and which affords to the other theatres of Paris a standard of dramatic excellence. The Comédie Française is, in fact, financially so successful that it costs the Government very little, but it is only by being able to support temporary pecuniary failure that it or any other T. can ensure permanent artistic success. To establish in England a T. precisely on the model of the Maison de Molière, would of course be impossible, but in some more or less similar institution lies the only chance for a revival of true dramatic excellence. We have no lack of talent either among authors or actors, but it is frittered away in catchpenny enterprises. The manager of a T. is too often possessed of about as much taste and culture as his own scene-shifters. His sole desire is to obtain an immediate return for his capital. He buys pieces and engages actors who will please the mob. While the causes of this state of things remain untouched, no real and abiding improvement can be hoped for.

Theatrical literature is of almost unlimited extent. On the construction of theatres see Ferrario's work already mentioned; Wyatt's *Observations on the Principles of Design for a T.* (Lond. 1811); the *Transactions of the Royal Institute of British Architects for* 1860 and 1864; a series of papers by Percy Fitzgerald in the *Art Journal* for 1876; E. M. Shaw's *Fires in Theatres* (Lond. 1876); E. Trélat's *Le Théâtre et l'Architecte* (Par. 1860); C. Garnier's *Le Théâtre* (Par. 1871); C. Nuitter's *Le Nouvel Opéra* (Par. 1875), condensed in *Scribner's Magazine* for the same year. On theatrical history in general see Riccoboni's *General History of the Stage* (Lond. 1754); Dunlop's *Life of G. F. Cooke* (Lond. 1815); Collier's *History of Dramatic Poetry* (Lond. 1831); Geneste's *History of the English Stage* (10 vols. Bath 1832); Mrs. Mathews' *Memoirs of C. Mathews, Comedian* (Lond. 1839; new ed. 1860); Luccas's *Histoire Philosophique et Littéraire du Théâtre-Français* (Par. 1847-63); Ricord's *Fastes de la Comédie Française* (Par. 1821); E. Devrient's *Geschichte der Deutschen Schauspielkunst* (Leip. 1848-61); P. Fitzgerald's *Life of David Garrick* (Lond. 1868); the same author's *Kembles* (Lond. 1871), *Principles of Comedy and Dramatic Effect* (Lond. 1870), and *Romance of the English Stage* (Lond. 1874); Dr. Doran's *Their Majesties' Servants* (2d ed. Lond. 1865); C. M. Young's *Memoir* (Lond. 1871); Planché's *Recollections and Reflections* (Lond. 1872); *Macready's Reminiscences*, edited by Sir F. Pollock (Lond. 1875); G. H. Lewes' *Actors and Acting* (Lond. 1875); Dutton Cook's *A Book of the Play* (Lond. 1876); H. Barton Baker's *Our Old Actors* (Lond. 1878).

Laws as to Theatres.—In the United Kingdom, 6 and 7 Vic., c. 68, provides that no house shall be kept for the performance of stage plays without authority by letters patent, or by license of the lord chamberlain, or of the justices of the peace. The lord chamberlain and the justices, within their jurisdictions, may suspend any license in case of riot or misbehaviour, or they may order the theatres to be closed on any public occasion. No new play, or old play altered, to be acted or recited till seven days after copies have been sent to the lord chamberlain with a fee not exceeding two guineas. The lord chamberlain may disallow the whole of the play or part of it. Infraction of his order subjects the offender to a penalty of £50, and the license of the theatre in which the offence is committed becomes void.

Thebai'a, or **Thebaine',** one of the active principles of Opium (q. v.), produces in all the lower animals powerful convulsions resembling those resulting from strychnine. T. has been employed in physiological experiments only.

Thebes (Gr. *Thebai*), the chief city, at least in historical times, of Boetia, was situated in the southern part of the country nearly midway between the Corinthian Gulf and the Euboean Sea, at the foot of Mount Teumessus, which rises about 150 feet above the plain, and between the two streams Ismenus and Dirce. Owing to the total destruction of T. by Alexander, the various localities are very difficult of identification, though the site itself is still occupied by the village of Thivi. The plan given by Forchhammer divides the city into two parts, a W. and E., separated by the little stream Strophia, the W. or upper part containing the Cadmeia or citadel on the S. and the Agora on the N., while the E. or lower city had the Ismenus on the S. and the Ampheion on the N. Of the celebrated seven gates he places the Homoloides, Electra, and Hypsistæ on the S., the Krenaiai on the W. between the Citadel and the Agora, and the others on the N. With these points fixed, there is no further difficulty in identifying all the buildings mentioned by Pausanias (ix. 8-25). T. is peculiar among Grecian cities, in that, though only for one brief period rising above the rank of third in importance, she occupies as prominent a position in the legendary as in the historical portions of the annals of the country, while her traditional connection with Phœnicia has of late turned the eyes of scholars to her with a new interest. Of her legendary heroes, Cadmus, Amphion, and Œdipus with his fated house are the most celebrated; in Greek history none surpass in greatness of achievement or nobility of character Epaminondas and Pelopidas. For the part played by T. in the general history of Greece, see *Hellas*. Besides the histories of Thirlwall, Grote, and Curtius, see Sankey's *Spartan and Theban Supremacies* (Lond. 1877); and for topography, Leake, *Northern Greece*; Ulrichs, in *Abhandl. der Bayer. Akad.* for 1841; and Forchhammer, *Topographia Thebarum Heptapylarum* (Kiliæ 1854).

Thebes (the *Taabe* of the hieroglyphics, *No* or *No-Ammon* of the Scriptures, and *Diospolis* of classic writers), the former

capital of Upper Egypt, extended along both sides of the Nile over a plain some 12 miles square, in lat. 25° 41′ N. Of unknown antiquity, it reached its zenith under the 18th dynasty, and for nigh eight centuries continued to flourish (1600–800 B.C.), its decay being hastened by the rise of Memphis. Cambyses sacked it in 525, and Ptolemy Lathyrus in 86 B.C., but its ruins still attest its former grandeur. Four villages partly occupy the ancient site, Luxor and Karnak on the eastern, and Gourneh and Medinet Abu on the western bank of the Nile. The eastern half contained the great body of the population, the two obelisks of Rameses III., one of which now stands in the Place de la Concorde at Paris, and the Palace of the Kings, with its great hall 329 feet long by 179 feet broad. In the western portion, besides the two famous statues of Memnon (q. v.), were the Menephthium, Memnonium, Thothmesium, and other temples and palaces, rising in terraces one above the other, and connected by avenues of colossal sphinxes, which led to the Necropolis, extending for 5 miles along the Libyan Hills. See Captain Abney's *T. and its Five Greater Temples* (Lond. 1877), Miss Edwards' *One Thousand Miles up the Nile* (Lond. 1876), and Baedeker's *Egypt* (new ed. 1878).

Thecodon'tia, an order of extinct *Reptilia*, regarded by Owen as crocodilian in character, but by Huxley and others as resembling the *Deinosauria* (q. v.) more closely than Crocodilia. Owen defines Thecodont reptiles as having biconcave vertebræ, with the ribs of the trunk long and bent, the front ribs having a divided head. The sacrum consists of three vertebræ, and the femur or thigh has a third trochanter. The limbs are adapted for walking. The teeth have compressed crowns, are pointed with serrated margins, and arise from distinct *alveoli* or sockets. The T. belong to the Triassic age. *Belodon*, *Palæosaurus*, and *Thecodontosaurus* are three notable genera.

Theft. See LARCENY OR THEFT.

Theiss (Mag. *Tisza*), the largest river of Hungary and the principal tributary of the Danube, is formed by the Black T. from Czorna and the White T. from Rusky in the Carpathian mountains. It flows first N.W., then S.W. and S., past Szigeth, Tokay, Szolnok, Csongrad, Szentes, and Szegedin, until it joins the Danube 5 miles below the town of Titel, after receiving from the right the Borsova, Bodrog, and Hernad, and from the left the Visso, Szamos, Korös, and Maros. The T. is 840 miles in length, and its basin has an area of 80,000 sq. miles. It is navigable for large vessels at Szolnok, and has at Tokay a breadth of 200 feet, at Szegedin 400 feet, and at Titel 740 feet.

Thel'wall, John, born in London, 27th July 1764, after a brief apprenticeship to a tailor, studied law, but refusing from conscientious scruples to be called to the bar, entered on a literary career (1785). His *Poems on Several Occasions* (1787) were followed by *Poems written in the Tower and Newgate*, whither his bold harangues in favour of the French Revolution brought him in 1794. With Horne Tooke and Hardy he was tried for high treason but acquitted, after which he became a public lecturer on politics, and in 1801 on elocution, as such distinguishing himself by his treatment of stammering. He published several works upon this and kindred subjects, and died at Bath, 17th February 1834. See his Life, by his widow (1837).

Them'is (Gr. 'law established by old usage'), daughter of Uranus and Gaia, is in the Homeric poems the embodiment of law and order, convoking the council of the gods at the command of Zeus. The worship of T. was established at Olympia, Thebes, Athens, Tanagra, and Trœzene. On coins T. is figured like Athena, and has a cornucopia and pair of scales.

Themis'tocles, an eminent Athenian general, was born at Athens about 514 B.C. His youth was wild and stormy, yet from an early age he showed a strong inclination towards politics, in which his great talents soon began to exhibit themselves. He attached himself to the democratic party in the state, and during the enforced exile of his rival Aristides he ruled the state with almost absolute sway. His great object was to make Athens a naval power. To this end he persuaded the citizens to spend part of the revenues of the city on ships instead of dividing them. In 480 B.C. Xerxes invaded Greece, and the wisdom of the council of T. became apparent. At the battle of Salamis (480) the combined Greek fleet defeated the Persians and destroyed the majority of their vessels. It was recognised that this victory was largely due to T., and all Greece showered thanks and honours upon him. By his advice the Athenians restored their walls, which the Persians had pulled down. The ungenerous opposition which the Spartans made to this necessary work of self-defence was defeated by the skilful diplomacy of T., who at this time was at the summit of his power. A change soon came. He was accused of dishonourable conduct, the Spartans banded themselves with his enemies in the city against him, and in 471 the fickle populace ostracised the man who had saved Greece. T. went first to Argos, and remained there till in 466 the Athenians, instigated by the Spartans, sent to arrest him on a charge of treason. He then fled to Corcyra, and from thence to Epirus, but the vengeance of his foes still pursued him, and he was forced in 465 to take refuge at the court of Artaxerxes the successor of Xerxes. He was warmly welcomed, for the king believed he might yet conquer Greece by the help of the man who had saved her. T. encouraged these hopes, indeed they were his only passport to favour at the Persian court, but he died in 449 without having done anything to realise them. He was a man of brilliant and versatile genius, but destitute of fixed moral principles. To some extent he was patriotic, but his country always stood second to himself. Of that higher patriotism which moves the truly heroic soul to love and serve an ungrateful fatherland he was entirely destitute.

Thénard, Louis Jacques, a French chemist, was born at La Louptière (Aube), 4th May 1777; studied chemistry at Paris under Bauquelin, was appointed (1810) Professor at the College de France, and later at the Polytechnic School and in the philosophical faculty of the University; in 1825 was created Baron, and in 1852 peer of France. In 1837 T. resigned his professorship at the Polytechnic School, and in 1840 that at the University. In 1842, however, he became grand officer of the legion of honour, and in 1850 member of the Council of Public Instruction. He died at Paris, June 21, 1857. T.'s chief work is *Traite de Chimie Élémentaire* (5 vols. Paris 1813–17; 6th ed. 1833–36). Along with Gay-Lussac he published in 1816 *Recherches Physico-Chemiques*, and for several years was co-editor of the *Annales de Chimie* and *Annales de Physique et Chimie*.

Thenard's Blue is a mixture of the phosphates of cobalt and alumina, and is prepared by calcining in a covered crucible phosphate of cobalt with precipitated alumina.

The'obald, Lewis, the son of a Kentish attorney, was born at Sittingbourne, in the latter part of the 17th c. Educated for the law, he turned aside to literature, and in 1714 published a translation of the *Electra* of Sophocles, followed in 1715 by translations of the *Œdipus*, the *Plutus*, and *Clouds* of Aristophanes, and an original tragedy entitled *The Persian Princess*. To these were subsequently added contributions in opera, melodrama, and pantomime, besides the tragedies of *The Perfidious Brother* (1716) and *The Double Falsehood, or, the Distrest Lovers* (1727), the latter of which was brought out at Drury Lane as a play of Shakespeare's. None of these efforts, however, would have preserved T.'s name. He owes his unhappy immortality to a quarrel with Pope. In 1726 he put forth a pamphlet called *Shakespeare Restored, or, Specimens of Blunders Committed and Unamended in Pope's Edition of this Poet.* Pope revenged himself by making T. the hero of the *Dunciad*; but when T.'s own edition of Shakespeare was published (Lond. 7 vols. 1733) he in turn enjoyed a triumph. Thirteen thousand copies of it were sold, and the reputation of Pope's edition was ruined. T. died September 18, 1744.

Theobro'mine ($C_7H_8N_4O_2$), a feeble base present in cocoa and chocolate, is extracted from cacao-beans in much the same way in which caffeine is extracted from coffee. When pure it is a colourless, crystalline powder, sparingly soluble in boiling water, and still less so in alcohol and ether. It gives crystalline salts with certain acids. From theobromide of silver, Caffeine (q. v.) may be prepared along with iodide of silver by treatment with iodide of methyl, so that caffeine ($C_7H_7CH_3N_4O_2$) may be regarded as methyl T.—a hydrogen molecule being replaced by a methyl molecule.

Theoc'racy (Gr. 'government by God') is a form of government in which the national deity is also regarded as the king of the nation; in other words, a stage of civilisation and religion in which political power is exercised by a sacerdotal caste. The most notable instance of a T. is found among the Israelites previous to the election of Saul as king.

Theoc'ritus, the most celebrated of the Greek bucolic poets, was, according to an epigram in the Greek Anthology (Brunck, *Anal.* vol. i. p. 263; Jacob's *Anth. Græca*, vol. i. p. 194; vol. vi. p. 490), a native of Syracuse and son of Praxagoras and Philina. Suidas, however, adds that some made him the son of Simichus or Simachidas, and that he was a native of Cos and only a *metoikos* at Syracuse. This statement vanishes on investigation. The use of the term *Simichidas* in a verse of the *Syrinx* carries nothing with it. We might as well conclude that the real name of Virgil was *Tityrus*, from the pseudonym adopted by him in the first of his Eclogues. The whole of the averment regarding Cos seems to have arisen out of his connection with Philetas, whose pupil he was (*vid. Schol. ad Id.* vii. 40). T. seems to have been intimately associated with the poet Aratus, author of the *Phænomena.* This is not strange, since the court of the Ptolemies was the mart of intellect then; and we know for certain that T. at least once in his life visited that great centre of poetry and philosophy. More than one of his idylls may have been written there; there can be no doubt left in the mind of a careful reader that he was at Alexandria and enjoyed for a time the friendship and patronage of Ptolemy Philadelphus (*vid. Idyl.* xiv. xv. xvii.). His 16th Idyll was unquestionably written at Syracuse, after the accession of Hiero (270 B.C.). The inference from all that can be gleaned from the poet himself as to his period, is that he flourished 284–262 B.C. It is impossible to discuss here the question of T.'s intimacy with Philetas, or the influence of the works of that poet on his mind. It is at least certain that T. was at Syracuse during the reign of Hiero II., and it is extremely probable that his 16th Idyll was written after that monarch's alliance with the Romans, B.C. 263 (*vid. Id.* xvi. 76, 77). T. was far from being satisfied with his treatment at the court of Hiero, or with the state of affairs generally (*vid. Id.* xvi. *passim*). How he spent his later years is wholly unknown, yet we may well suppose that the closing period of his life was devoted to the contemplation and enjoyment of rural life, the praise of which has made his name so famous and won for him the foremost place among bucolic bards. The genuineness of some of the idylls is disputed. This could hardly be otherwise. But the chief glory of T. lies in his being the founder of a fresh and fertile school of poetry. Bion and Moschus, a little later, achieved distinction in the same walk. Virgil drawing from the same sweet well enriched Roman literature with poems of marvellous beauty, however inferior to those of his prototype. Legends that blossomed into birth in the popular myths sung aforetime by Stesichorus and Sophron, assumed under the master-hand of T. a freshness which never failed to charm. For his idylls are the very quintessence of natural delights—whispering pines, shepherd-loves, and mildly-moaning waves. His idylls might have been written yesterday. In character they are mimetic and dramatic. Yet they are in the strict sense of the term *Eidullia.* Innocence, simplicity, fidelity—the characteristics of the early Sicilian race—constitute his objective theme. The *Adoniazusæ*, a masterpiece of depiction of female character, is characterised throughout by genuine dramatic force and spirit. Language and rhythm, symmetry and proportion, with the rare faculty of easy transition, were with T. natural gifts. Above all, he had a thorough knowledge of his art and of its limits. Incongruities of style and subject may occasionally be detected in his idylls, but in the writings of what poet is it otherwise? It may be mentioned that the pieces, the genuineness of which is disputed, are the 12th, 17th, 18th, 19th, 20th, 26th, 27th, 29th, 30th. For full information on the integrity of the poems, the reader is referred to the works of Eichstädt, *De Carm. Theoc. ad sua genera revocat.*, &c. (4to. Leip. 1794); E. Rheinhold, *De genuinis Theocr. Carm. et suppositis* (Jena 1819); and A. Wissova, *T. Theocriteus* (Wratislaw 1828), with the prefaces of Warton, Meineke, and Wüstemann, in their editions of T. The *editio princeps* of the idylls without place or date is supposed to have been printed at Venice, 1481. The next is the Aldine (fol. Ven. 1495). More recent editions are those of Warton (2 vols. 4to. with notes 1770); Brunck (4to. 1772); Gaisford, in his *Poetæ Minores* (8vo. Oxon. 1816, 1820–23); Meineke (12mo. Leip. 1825); Wüstemann in Jacobs' and Rosts' *Bibliotheca Græca*—a most useful edition (8vo. Gothæ 1830); Wordsworth (8vo. Cantab. 1844); Paley (8vo. Cantab. 1863); and Snow (Oxf. Clar. Press 1869). The edition of H. L. Ahrens (Leip. 2 vols. 1655–59) is the most critical and in some respects the best of all; but the unceremonious way in which he has dealt with the text in poems of acknowledged genuineness is a fatal blot on a work of singular scholarship and ability. T. has been done into most of the tongues of Europe. Some of the German renderings are exceptionally good. English translations are numerous. Those of Creech, Hoyland, Fawkes, Polwhele, Chapman, and Calverly are the most notable.

Theod'icy (Gr. 'the judgment of God') is any theory professing to reconcile the attributes of God with the present order of things in the world; or, more specially, an explanation of the existence of evil. According to the Christian doctrine of Divine Providence, man is the great end of creation, and the whole economy of nature is made subservient to the education of mankind. But Christian writers from the first felt a difficulty in avoiding anthropomorphic language in expressing the idea that God takes care of individuals, and in reconciling the liberty of man with the love and justice of God. In opposition to Dualism (q. v.), the evils existing in the world were regarded either as the necessary consequences of sin, or as phenomena which, good in themselves, assumed the appearance of evil in consequence of our limited knowledge, the corrupt state of our mind, or the abuse of our moral freedom. The keynote of every T. was expressed by Chrysostom, 'Christians rise above all trials by love to God.' This theory was elevated into a philosophical science by Leibnitz in his work *Essais de Theodicée sur la Bonté de Dieu, la Liberté de l'Homme, et l'Origine du Mal* (1710).

Theod'olite (derivation uncertain), an important instrument for measuring angles in geodetic operations. As now constructed, the instrument consists of a telescope, mounted so as to be able to measure altitude and azimuth angles. There are two concentric horizontal circles, the one fixed and graduated, the other capable of rotation round a vertical axis, and working upon the fixed circle with an attached vernier for reading the angle of rotation indicated on the latter. On this upper movable circle a vertical circle is fixed, to the centre of which the telescope is pivoted. The instrument is set upon a tripod stand, and is adjusted by screws and levels.

Theodo'rus belonged to a wealthy family of Antioch, where he was born in the first half of the 4th c. In 393 he was made Bishop of Mopsuestia in Cilicia, and is thought to have died in the year 429. He was the most eminent exegetical writer of the Syrian school of his time. Like his contemporaries, Jerome (q. v.) and Chrysostom (q. v.), he held a liberal view of the inspiration of the Scriptures, and applied the grammatico-logical method to its interpretation, as opposed to the allegorical method of Origen (q. v.). In theology he contended against the current of popular opinion of the time on several points. 1. He denied that the Spirit owed his existence to the Son (see FILIOQUE). 2. He was the Father of the Nestorians (q. v.), in making a clear distinction between the divine and the human nature in the person of Christ, holding that the latter was developed into the former by a gradual process. His writings, most of which are lost, were anathematised after his death in an edict of Justinian (544), called 'of the three chapters' (*i.e.* articles). See Fritzche, *De Theodori Mopsuestiani Vita et Scriptis* (Halle 1837).

Theodore'tus, born at Antioch towards the end of the 4th c., and ordained Bishop of Cyrus, a small town near the Euphrates, 420, was a disciple of Theodore of Mopsuestia (q. v.), with whose opinions generally he agreed, and with whom he joined in defending those opinions in opposition to Cyril of Alexandria and the Fathers of the Council of Ephesus. Dioscorus, Patriarch of Alexandria, procured the condemnation of T. for Nestorianism in the second Council of Ephesus (449). But this sentence was reversed at the Council of Chalcedon (451), at which Dioscorus was condemned along with Eutychianism (q. v.); and T., who had been banished, was restored to his see, in which he remained in peace till his death about 457. T. wrote a number of valuable commentaries on the Scriptures, a Church History, which is a continuation of Eusebius, a history of heresies, various controversial writings, &c. The best edition of what are extant is by Schulze and Nösselt (Halle, 10 vols., 1768–74).

Theod'oric (Goth. *Thiudareiks*, 'king of the people;' Ger. *Theuderich*, later *Dietrich*) **the Great**, King of the East Goths, was the son of the Amal Theodemir by his favourite Erleva, and was born near Vienna, 455 A.D. The Byzantine Emperors Marcian and Leo I., having failed to pay the annual 300 pounds of

gold guaranteed to the E. Goths, the latter, pressed forward by hunger and the Huns, entered Illyria, and after a new treaty (462) sent T. as a hostage to the court of Constantinople. At eighteen he was restored to his father, whom he soon after joined in a new incursion into the Byzantine territory, and after whose death in 475 he extorted from the imperial government a grant of fertile lands in Upper Mœsia. Zeno, seeking his friendship, gave him the title of 'Patrician,' but continued to intrigue secretly against him, till T. suddenly took up arms, and seized the district of Pataulia in Illyria. The emperor soon made peace with a new treaty that gave to T. part of Dacia and lower Mœsia, with the title of general and consul, in return for which he quelled the rebellion of Johannes in Asia Minor. The Rugians, hard pressed by Odoacer, now called on T. for help. The Byzantine court was glad to avail itself of the opportunity of turning the ambition of its formidable neighbour in the direction of Italy. T. proceeded thither in 488, defeated Odoacer in three great battles, on the Isonzo (August 28, 489), at Verona (September 27, 489), and on the Adda (August 11, 490), and after a protracted siege took Ravenna, his last refuge. A treaty struck by the two leaders, dividing between themselves the government of Italy, was soon set aside through the murder of Odoacer by T. during a drinking-bout (March 5, 493). The Empire of the E. Goths now included Italy, Sicily, Dalmatia, Istria, and part of Pannonia, and T. was the most powerful of all the German rulers. His internal administration was wise and orderly. To his Goths he gave the third part of the lands and the defence of his empire, while to the Italians he confirmed the Roman constitution and law. Yet he could not bring about a true union of the two alien peoples, nor reconcile the Roman clergy to the Arian heresy of the Goths. He favoured art and learning, and adorned with fine buildings his residence cities, Ravenna and Verona. Though Thierry attributes to T. 'instincts the most violent, cruelty, cunning, and pitiless egotism,' it cannot be denied that for three-and-thirty years his reign was marked by wisdom, justice, and prosperity without a parallel from the days of the Antonines to the time of Karl the Great. A dark blot on his later reign is the execution of the philosophers Boëthius and Symmachus, whom he had held in high honour, on suspicion of complicity in a conspiracy. T. died August 30, 526, leaving no son. His crown passed to his grandson Athalaric, a boy of seven years, the son of his daughter Amalasmintha. T. lives in song and legend as Dietrich (q. v.) of Bern (Verona). See Gibbon, *Decline and Fall of the Roman Empire*, chap. xxxix.; Kingsley, *The Roman and the Teuton* (1864); Deltuf, *Théodoric, Roi des Ostrogoths* (Par. 1869).

Theodo'sius the Great, Roman Emperor, was born at Cauca in Galicia, Spain, about 346. At an early age he became a soldier, and continued in successful military service till the execution in 376 of his father, a distinguished Roman general, on some unknown charge. He then retired to Spain, but in two years was appointed by Gratian administrative head of the empire in the East. The empire was at that time threatened by the Goths, but T., by two decisive victories over the invaders, succeeded in repelling the danger. A new peril soon threatened the state. In 383 Maximus, a native of Spain then resident in Britain, raised a revolt against Gratian. In the war that followed he was successful; Gratian was slain and Maximus became emperor of a considerable part of the West. A hollow peace was made between T. and the successful rebel, but when the latter in 387 made an attack on Italy, then under the rule of Valentinian, brother of Gratian, T. at once declared war against him. In the ensuing contest he was completely successful; Maximus was killed, Valentinian reinstated, and the conqueror entered Rome in triumph. T. was now at the height of his greatness, but he had yet to learn that there was a power on earth—though it claimed to be not of the earth—that was greater than his. The imperial officer at Thessalonica, with some soldiers, had been murdered in a mob riot. T. inveigled the defenceless populace into the circus, and then let loose upon them a horde of barbarians. At least 7000 persons are said to have perished. St. Ambrose, Archbishop of Milan, received information of the massacre, and shortly after, as the emperor was about to enter the cathedral, the courageous prelate confronted him, taxed him with his crime, and refused him admittance. T. acknowledged his sin, but it was not till eight months had elapsed, and many humiliating penances had been performed, that the Church again restored him to full communion. In 391 T. returned to Constantinople, but next year he was again obliged to begin war against Arbogastes and Eugenius, who had dethroned and killed Valentinian, and seized the empire of the West. T. was once more successful. The usurpers were defeated and slain, but the conqueror did not live to enjoy the fruits of his victory. He died at Milan, 17th January 395, immediately on the conclusion of the war. T. was zealously orthodox, and prosecuted heathens and heretics with equal ardour. By severe enactments he finally destroyed Paganism, and it is largely due to him that the 'Arian Heresy' did not become the creed of Christendom. He was an able general and a sincere man, though violent bursts of passion marred his character. See Fléchier, *Histoire de Theodose*; Gibbon, *Decline and Fall of the Roman Empire*; Müller, *De Ævo Theodosiano* (1797–98), and Dr. A. Güldenpenning and Dr. J. Ifland, *Der Kaiser T. der Grosse* (Halle 1878).—**T. II.**, Emperor of the East (408–450), was the son of the Emperor Arcadius, whom he succeeded, and grandson of T. the Great. During his reign he was engaged in war with the Persians and Huns. His reign was inglorious, his character unkingly. Yet in a private station, the pious, temperate, and lettered T. might have found a better field for the exercise of his virtues. He died in 450, and was succeeded by his sister Pulcheria, who had long really ruled the state. During his reign the *Codex Theodosianus* was published (see CODE). See Gerlach, *De Theodosio Juniore* (Zittau 1751), and Gibbon's *Decline and Fall of the Roman Empire*.

Theodo'tion, a native of Sinope or Ephesus, is the author of a Greek version of the Old Testament. He flourished in the latter half of the 2d c.; was first a disciple of Tatian, then a Marcionite, and finally an Ebionite. His version is simply a [illegible] of the Septuagint disfigured and accommodated to his Ebionitish opinions. Singular to say, in spite of its heretical origin, it was not rejected by the Church, and was even in some parts, *e.g.* the Book of Daniel, a special favourite.

Theog'ony (Gr. 'the genealogy of the gods') is the [illegible]al name given to that part of classic mythology which treats of the descent of the gods. Hesiod (q. v.) is the author of a poem on the subject.

Theol'ogy (Gr.) means literally a discourse about the gods, and Orpheus, Hesiod, and Homer were called 'theologians' among the Greeks because their poems treated so much of the gods. Aristotle classed the sciences under the heads of Physics, Mathematics, and T.; and the Christian Fathers called St. John The Theologian, because the divinity of Christ is rendered so prominent by him. Other definitions of T. are 'the science of the supernatural,' 'of divine things' (Hooker), and 'of religion;' but in all those there is involved a certain ambiguity, owing to the difficulty of agreeing on what these terms precisely denote. T. is accordingly defined as 'the science which is concerned with the facts of divine revelation contained in the Bible, so far as they concern the nature of God and our relation to Him as His creatures, as sinners, and as the subjects of redemption.' But as some of those facts are revealed in the works of God, a distinction is made between Natural T. and Christian T. proper. See Hodge, *Syst. Theol.* (Edin. 1873).

Theophras'tus, a Greek philosopher of the peripatetic school, was born at Eresus, in Lesbos, about 371 B.C. He studied at Athens under Plato and Aristotle. On the death of the latter, T. succeeded him as head of the Academy, and spent a long and honourable career in explaining and expounding his predecessor's doctrines. The date of his death is quite uncertain. It seems not to have been earlier than 285 B.C. T., like his master, wrote works on a variety of subjects. Many of them are lost, but we still possess—1, *The Characters*, a sketch of the most common human vices; 2, part of a work on Metaphysics; 3, a treatise on Sensation; 4, a History of Plants in ten books; 5, a work on the Causes of Plants, in ten books, some of which are yet extant; 6, a work on Stones; 7, a treatise on Fire, in two books, one of which remains. We have besides a host of fragments on kindred topics. The best edition of T. is by J. G. Schneider (5 vols. Leip. 1818–21). See Kirchner, *Die botanischen Schriften des T.* (Leip. 1874).

The'ory (Gr. *theōreō*, 'I look at,' or 'I contemplate') is a philosophical and scientific term of somewhat loose application. Generally it is used in opposition to 'practice,' as science is opposed to art. It is thus a general body of truth on any subject.

Sometimes it means the same as hypothesis, and in this sense may denote something false, as when we say, 'this T. of the relations of capital and labour is quite erroneous.' At other times it is used to mean a definite principle scientifically ascertained to be true, as the T. of gravitation.

Theos'ophy (Gr. 'divine wisdom') is a general name given to those systems of philosophy which profess to attain to a knowledge of the Divine Being by spiritual ecstasy, direct intuition, or special individual relations. Neoplatonism (q. v.) is a typical example of such a system. See MYSTICISM.

Therapeu'tæ (Gr. 'physicians') were a sect of ascetics mentioned in a writing ascribed to Philo (q. v.)—*De Vita Contemplativa*—who, seized with a longing for a divine life, forsook home and goods, relations and friends, and settled in the solitude of the country. The greater number lived near Lake Mareotis, to the S. of Alexandria, each in his own cell, in which he lived alone for the whole week, not even looking out. They prayed at the dawn and at twilight, and in the intervals studied their sacred books. None ate till night, while many fasted altogether for several days, and some for the whole week. Sabbath was the day for meeting in their common sanctuary. From the description given by Philo, the T. were always supposed to be a branch of the Jewish sect of the Essenes (q. v.), between whom and the T. there was the closest resemblance. Eusebius expressed the opinion that the sect described by Philo was the Christians. Several eminent scholars are now of opinion that the book *De Vita Cont.*, in which is the only mention of the T., was composed in the name of Philo by a later writer (3d c. ?), who sought to give his ideal of asceticism.

Therapeut'ics (Gr. *therapeuō*, 'I heal') may be defined as the science of the application of medicines to the cure of disease. T. treats of the various actions of medicines upon the diseased system, and the means by which nature may be aided in her return to health.

There'sa, St. See TERESA.

Therapi'a, a village on the Bosphorus, 21 miles E.S.E. of Constantinople, from which it attracts many residents by its beautiful situation and delightful climate.

Theresio'pel, or **Maria Theresiopel** (Hungar. *Szabadka*), a straggling agricultural town in the Bácska, the most fertile corn district of Hungary, between the Theiss and the Danube, 30 miles S.W. of Szegedin by rail. It has a large trade in corn, hides, wool, wine, fruit, and tobacco. Pop. (1869) 56,323.

Theri'aca (from Gr. *thēr*, 'a wild beast') originally denoted a compound prepared by Andromachus of Crete, physician to the Emperor Nero, which continued in high repute until recent times. In Venice, Holland, France, and other places it had to be prepared with certain solemnities in the presence of the magistrates. It received its name from the belief that it was an antidote to the poison of venomous creatures. The word *treacle* is a corruption of T., and was first applied to a syrup, medicine, or electuary, and then, from similarity of appearance, to the uncrystallised residue obtained in the preparation of sugar, and known as molasses.

Ther'midor', called also **Fervidor**, the 11th month in the calendar of the First French Republic, lasting from July 19th to August 17th. Memorable in the history of France is the 9th T. of the second year (July 27, 1794), the date of the fall of Robespierre and the termination of the Reign of Terror. Those who had brought it about were afterwards known as *Thermidoriens*.

Ther'modynam'ics, as the name implies, is the branch of theoretical physics which treats of heat as a mechanical agent, and is the basis upon which the modern doctrine of energy is built. The second interpretation given by Newton of his third law of motion (see MOTION, LAWS OF) all but enumerates the principle of the conservation of energy. Ignorant, however, of the true nature of heat, he was unable to trace the mechanical loss caused by friction to its final issue. Not till more than a century after the publication of the *Principia* was any attempt made to fill the gap, and then the valuable experimental results of Rumford (1798) and Davy (1799), though conclusively disproving the accepted caloric theory, were given to an unappreciative world, and failed to excite any real interest until forty years later, when their discoveries were rediscovered. In 1812 Davy wrote, 'The immediate cause of the phenomenon of heat then is motion, and the laws of its communication are precisely the same as the laws of the communication of motion.' Here then the dynamical theory of heat was enunciated, but it was carried no further, and not till the experiments of Colding and Joule, executed independently about 1840, were published, can T. be regarded as established. About the same time Séguin and Mayer approached the same subject, and deduced from experiment values of the mechanical equivalent of heat (see EQUIVALENT, JOULE'S). They, however, went to work upon hypotheses or rather different forms of the same hypothesis which we now know to be false; so that their claims as the *founders* of the doctrine of energy cannot be maintained against those of Colding and Joule, who went to work in a legitimate way. Mayer, however, deserves great merit for the manner in which he has developed and applied the conservation principle. In the more restricted sphere of T., Clausius, Rankine, and Thomson have been the great developers; and to the last-mentioned is due the modification of Carnot's forgotten cycle of operations to suit the true theory, and the deduction therefrom of the doctrine of the dissipation of energy. T. is based upon two laws. The first law enunciates heat to be a form of energy and subject to the conservation principle—an experimental truth rigorously established by Joule. Clerk Maxwell gives it in the form: When heat is transformed into work or work into heat, the quantity of work is mechanically equivalent to the quantity of heat. A given quantity of work can always be transformed into an equivalent quantity of heat; but in transforming heat into work a certain limitation exists which is expressed in the second law of T. This law asserts that it is impossible, by physical processes, to transform any part of the heat of a body into mechanical work except by allowing heat to pass from that body to another at a lower temperature; or in Thomson's words, it is impossible by means of inanimate material agency to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects. This is the law upon which Carnot's principle is based—a principle which has led to results of the highest consequence. The principle is that the efficiency of a *reversible engine* is the greatest that can be obtained with a given range of temperature. Now a reversible engine, in Carnot's sense, is an altogether unrealisable heat engine, which can be made to go through a complete cycle of operations, either forwards or backwards. In other words, not merely is the engine able to do work while it transfers a given quantity of heat from the boiler to the condenser, but, by an expenditure of an equivalent quantity of work upon it, may be made to take back the same quantity of heat from the condenser to the boiler. In subjecting such an engine to a cycle of operations, the engine must be brought back to its original condition before any conclusion can be drawn regarding the relation between the heat which has disappeared and the work which has been done. Séguin, when he assumed that the work done by an expanding heated body was the equivalent of the heat which it loses, and Mayer, when he went to work upon the hypothesis that the amount of heat produced in compressing a gas is equivalent to the work done in compression, violated this principle, so that their conclusions were logically untrustworthy. It is easily demonstrable, upon the conservation principle, that Carnot's reversible engine is the most perfect possible engine, and that consequently all reversible engines working between the same temperatures have the same efficiency. For a small difference of temperature the efficiency is a function only of the temperature, and this efficiency, divided by the difference of temperatures, is called Carnot's Function. Thomson, defining temperature as the reciprocal of Carnot's function, has constructed a scale of temperature absolutely independent of the nature of the thermometric substance. Hence if t is the temperature measured according to this absolute scale of the source of heat, and t' that of the refrigerator or condenser, the efficiency may be expressed by the fraction $\frac{t-t'}{t}$. Now the efficiency is defined as the ratio of the work done to the heat supplied expressed in dynamical measure. Hence, if W is the work done, H the heat supplied to the engine, and h the heat given out to the condenser, all expressed in dynamical measure, we have

$$\frac{W}{H} = \frac{t-t'}{t}$$

$$W = H - h$$

whence $$\frac{h}{H} = \frac{t'}{t}$$

or, in a reversible engine the heat rejected is to the heat received as the absolute temperature of the refrigerator is to the absolute temperature of the boiler. From the first of these equations it is evident that the heat supplied cannot be wholly transformed into work unless the refrigerator is at absolute zero of temperature, a practical impossibility. Consequently, in a material system only a part of the intrinsic energy is available for work, and this available portion or *entropy* is continually diminishing because of the universal tendency of heat to diffuse itself, and reduce the system to a uniform temperature, when of course no work can be produced. This is Thomson's principle of the dissipation of Energy (q. v.). See Tait's *T.* (2d ed. 1877); Clerk Maxwell's *Theory of Heat* (1871); Tait's *Recent Advances* (1876); Rankine's *Steam-Engine* (1859), and the original papers of Clausius, Thomson, and Rankine, published in *Poggendorff's Annalen, Philosophical Transactions, Philosophical Magazine,* &c., within the last thirty years.

Ther'mo-Electri'city. At the surface of separation of any two different substances a difference of electrical potential exists, which is evidenced by the electrification consequent upon their being mechanically pulled asunder. If a circuit of two or more simple conductors (metals, for example) be formed, a difference of potential will exist at each junction; but as long as the junctions are kept at the same temperature the contact forces will balance, and no current will flow. If, however, one junction be heated, the potential equilibrium is destroyed, and, as first observed by Seebeck, a *thermo-electric* current will in general flow. Take for instance a simple circuit of iron and copper wire, and let a delicate galvanometer be included in the circuit, then if the one junction is gradually raised in temperature a current will be observed to set in, flowing from the copper to the iron through the hot junction. The effect is qualitatively the same if platinum be substituted for iron; but if palladium be used instead, the current is reversed, and flows from palladium to copper through the hot junction. In this way a thermo-electric series may be arranged, such that in a circuit formed with any one metal and one further down the list, the current produced by a *small* difference of temperature of the functions will flow from the latter to the former through the hot junction. Such a list is the following: iron, platinum, cadmium, silver, zinc, copper, lead, potassium, sodium, palladium, nickel, cobalt. The expression small difference is used advisedly, for experiment has proved that for larger differences of temperature the direction of the current may become reversed. Thus Cumming, in 1823, discovered that when one junction of an iron-copper circuit was kept at an ordinary temperature, and the other raised gradually, the current continued to increase until the temperature of the hot junction reached about 280° C., when the current reached its maximum, and on further heating began to fall off, until at about 560° C. it became reversed. This critical temperature is called the *neutral point*, and is different for every different pair of metals, being for some below zero, for others at a moderate temperature, and for others at a temperature too great for one or both metals composing the circuit. In every case, however, a neutral point is indicated by the relation between the electromotive force and the temperature. For all the ordinary metals, Tait has proved that the electromotive force satisfies the equation

$$E = a(t_1 - t_2)[t_0 - \tfrac{1}{2}(t_1 + t_2)].$$

Where t_1, t_2 are the temperatures of the junctions, t_0 the neutral point, and a a constant whose value and sign depend upon the particular metals employed. In other words, the electromotive force is a parabolic function of the temperature. These currents are evidently closely connected with the phenomenon discovered by Peltier, that when a current crosses the junction of two metals, the junction is heated when the current is in one direction, and cooled when it is in the other. Thus if a current be passed round an iron-copper circuit, the junction at which the current passes from iron to copper is heated and the other cooled, so that a reverse thermo-electric current is at once called into existence. Conversely when a thermo-electric current is maintained in a circuit, there is in consequence of the Peltier effect absorption of heat at the hot junction with simultaneous evolution of heat at the cold. Applying the laws of thermodynamics to the problem, Sir W. Thomson was led to the discovery of a most important and quite unexpected phenomenon, which he has called the electric convection of heat. He at once tested his theoretical result by experiment, establishing that a current flowing in an unequally heated iron bar carries heat from the cold parts to the hot parts, while in copper the current has an equalising effect upon the distribution of temperature throughout. Nickel, cobalt, palladium, and perhaps platinum, are similar to iron, while most of the other metals resemble copper. According to Le Roux, the effect in lead is inappreciable, and Tait has shown that at a high temperature the effect in iron and nickel is reversed, but at still higher temperatures becomes as it was before. The constant a in his thermo-electric formula depends upon the relative values of the effects in the metals used. The phenomenon is evidently the inverse of the discovery made by Magnus, that if the ends of the same wire are at different temperatures and they are brought into contact, an instantaneous current passes, the direction of which depends upon the metal. T.-E. has been practically applied for thermometric purposes in the thermo-electric pile, which consists of alternating strips of antimony and bismuth. The multiple junction so formed is very sensitive to minute differences of temperature, which are indicated on a galvanometer introduced into the circuit. See Thomson 'On the Electrodynamic Properties of Metals' (*Phil. Trans.* 1856), Tait's 'First Approximation to a Thermo-electric Diagram' (*Trans. of the Roy. Soc. of Edinburgh,* 1870-71), and Clerk Maxwell's *Electricity and Magnetism.*

Thermom'eter (Gr. *thermos*, 'heat,' and *metron*, 'measure') is an instrument for measuring the Temperature (q. v.) of a given body. The principle of its action depends upon a nearly universal property which matter has of expanding when heated. If the substance during the operation does not change its physical condition, as from solid to liquid or liquid to gaseous, this expansion is accompanied by a rise of temperature, to which for all bodies within certain limits the amount of expansion is approximately proportional. All gases, if they are not near their point of liquefaction, expand under the influence of heat very nearly according to Charles' Law, which states that at constant pressure the increase of volume is directly proportional to the rise of temperature, and is the same for every gas. Theoretically, then, we have here a method by which temperatures over a wide range can be measured; but practically the construction of a gas or air T. is extremely difficult, so that for ordinary thermometric purposes recourse must be had to the more convenient though less accurate liquid T. The expansion of solids is too small to be of any practical use. The liquid most generally employed is mercury, which, in virtue of many of its physical properties, is peculiarly suitable for these purposes. Its specific heat is small, so that a very small percentage of the heat which is necessary to bring it into the same thermal condition as the body with which it is in contact is lost; its coefficient of expansion is large, and is very constant through a considerable range; its conductivity is great, and this, aided by the connection currents which exist in all unequally heated liquids, rapidly brings the liquid to the same temperature throughout; and its freezing and boiling points are far removed from the ordinary temperatures. An ordinary mercurial T. consists of a glass tube, the bore of which widens out into a bulb at the lower end. The upper end is hermetically sealed after the mercury has been boiled in it, so as to drive out all the air. On cooling to the ordinary temperature, the mercury contracts nearly all into the bulb, the volume of which should be great compared to the volume of the narrow bore. The tube is then graduated according to a convenient method, and the temperature is indicated by the height at which the mercury column stands in the tube. In the three received methods of graduation, the freezing and boiling points of water at a certain pressure are chosen as standard temperatures. They are determined for every T. by direct experiment; the corresponding heights of the mercury column are marked, and the interval is divided into a certain number of equal divisions called degrees, which are then continued below and above the standard temperature. The corresponding temperatures on the Fahrenheit, Réaumur, and Centigrade thermometers are as follows:—

	Fahr.	R.	C.
Freezing point of water	32°	0°	0°
Boiling point of water	212°	80°	100°

The Fahrenheit zero is below the freezing point of water, the Réaumur and Centigrade zeros represent that temperature. The number of degrees between the standard temperatures is 180 on

the Fahrenheit and 80 on the Réaumur T., numbers which were chosen on account of their breaking up easily into integral aliquot parts. The former is much used in England, the latter on the continent, especially in Germany; but for scientific purposes the Centigrade is the best, and will probably supersede the others in time. Mercury freezes at — 40° C. and boils at 350° C. Beyond these limits, then, the mercurial T. is of no use. For very low temperatures the spirit-of-wine T. is used, but for high temperatures the air T. must be employed, or a thermo-electric junction, or an ordinary Pyrometer (q. v.). The ordinary T. gives only the temperature at the time the observation is made; but for meteorological purposes it is necessary to know the minimum and maximum temperatures during a given period of time. There are various forms of such self-registering thermometers which fulfil these purposes. One very ordinary form of maximum T. has a constriction in the bore just above the bulb, which is set so as to droop when the T. is laid horizontally. The mercury in expanding is pushed along the tube to the maximum temperature, but on contraction when the temperature falls the cohesion of the mercury is not sufficient to pull it through the narrow constriction, and the upper part of the column lies in position until the temperature is noted. The observer then erects the T., and things assume their normal condition in readiness for a new experiment. In another form a small piston is pushed on by the column of mercury advancing along the horizontal bore, and is left when the mercury retires. A similar action takes place in the spirit-of-wine minimum T., the small movable piston being, however, immersed in the liquid, and dragged back by the convex surface of the contracting liquid. These are the ordinary forms of maximum and minimum thermometers; but there are numerous modifications introduced by Caselli, Negretti, and Zambra, and other scientific instrument-makers.

Thermop'ylæ (Gr. lit. 'hot gates,' *i.e.*, 'the gates of the hot springs'), a famous pass leading from Thessaly into Locris, between Mount Oeta and an inaccessible morass forming the edge of the Maliac Gulf. As the vale of Tempe in the N. of Thessaly was the only pass into northern Greece, T. in the S. of Thessaly was the only road by which an invading army could enter southern Greece; but, like the former, it could be avoided by a circuitous mountain track, which surmounted Mount Callidromus at the back of the pass, and was called Anapæa. T. was the scene of the memorable struggle of Leonidas and his 300 Spartans against the invading hosts of Xerxes (480 B.C.), and of the unsuccessful attempts of the Greeks to repel the Gauls under Brennus (279 B.C.). Here also the Ætolians vainly attempted to make a stand against Philip the Macedonian (207 B.C.), and Antiochus against the Romans under the Consul Acilius (187 B.C.).

The'seus, the great legendary hero of the Ionians, and especially of the Athenians, was the son of Ægeus, king of Athens, by Æthra, and was brought up at Troezene by his grandfather Pittheus. As soon as he became a man, he took the sword his father had hid for him under a block of stone, and proceeded to Athens, destroying on the way the robbers Periphetes, Skiron, Kerkyon, and Procrustes (q. v.). At Athens his stepmother Medea attempted to poison him; but Ægeus recognising him by the sword, Medea was forced to flee. T. rid the land of the Marathonian bull; and soon afterwards, the messengers of Minos (q. v.) coming to Athens to fetch the yearly tribute of seven lads and seven maidens for the Minotaur (q. v.), T. offered himself to make up the number, and succeeded in slaying the monster with the help of Ariadne (q. v.). After the death of Ægeus, T. was king of Attica, and distinguished himself by wise government and heroic deeds. He founded the Panathenaic and Isthmian games, joined Hercules against the Amazons, and carried off their queen Hippolyte, who bore to him Hippolytus. After helping Pirithous to expel the Centaurs, he descended with him to Hades, to carry off Persephone; but both were overpowered and held below in chains till freed by Hercules. T. also took part in the Argonautic Expedition and the Calydonian Hunt. On his return to Athens, finding Menestheus, son of Peteos, on his throne, he retired to Skyros, where he met his death either by a fall from a cliff or by the treachery of King Lycomedes. The story of T. is essentially the story not only of the Hellenic heroes Perseus, Bellerophon, Meleagros, Œdipus, and Hercules, but of Rustem, Feridoun, and Siegfried.

The'sis (from Gr. *tithēmi*, 'I lay down') is a brief statement of an opinion, view, or proposition, which he who states it is prepared to prove by detailed argument. In a special academic sense T. means the dissertation which candidates for certain university degrees are obliged to give in, and which in former times they were required to defend publicly against all comers.

Thesmopho'ria, an ancient festival held exclusively by women in several districts of Hellas, especially Athens and Arcadia, in honour of Demeter *Thesmophoros* ('the lawgiver') as the foundress of agriculture, and thereby of ordered civil life, with the institution of marriage. At Athens the festival extended to three days, beginning with the 24th October. On the first day there was a procession to the temple of Demeter at Halimos, S.E. of the city; on the second a strict fast; and on the third day, called *Kalligeneia* ('the bearer of a fair offspring'), a joyous and unrestrained carousal. The licentiousness of the T. is caricatured in the *Thesmophoriazousai* of Aristophanes. See A. Mommsen, *Heortologie* (Leip. 1864).

Thes'pis. See Drama.

Thessalo'nians, Epistles to the, written by the Apostle Paul to the believers in Thessalonica, the metropolis of the second part of Macedonia, are the earliest of St. Paul's writings, and perhaps the earliest written records of Christianity. Paul had visited the city on his second missionary journey, in company with Silas, and perhaps Timothy, soon after he entered Europe (Acts xvii.). Having been driven from the city by the opposition and persecution of the Jews, from Athens Paul sent Timothy to Thessalonica to bring him word how it fared with the newly-founded church. On being joined at Corinth by his messenger he wrote an epistle commending their faith and zeal, of which Timothy had brought him word, and warning them against the mistaken expectation of the immediate return of Christ, which was leading them to neglect their worldly callings. The Second was written soon after the First (1 T. i. 1, 2 T. i. 1), and therefore both about 52–53, from Corinth. Some critics maintain that the internal evidence indicates that the second epistle was written first. If so, it was probably written from Berea, its chief object being to instruct the believers regarding the second coming of Christ, and refute a forged letter which had been sent to them in the Apostle's name (*cf.* 2 T. ii. 2), and which distorted expressions he had used.

Thess'aly, the largest political division of ancient Greece, now part of European Turkey, extends in its widest sense from the country N. of Thermopylæ as far as the Cambunian Mountains, and is bounded W. by Epirus, N. by Macedonia, E. by the Ægean, and S. by the Maliac and Pagasæan Gulfs and Mount Œta. The great central plain of T., watered by the Peneius, is enclosed by mountains, the chief of which are Olympus, Pelion, and Ossa in the N., Othrys in the S., and Pindus in the E. This plain, the most productive in all Greece, was famed in ancient times for its wheat, its flocks and herds, and its fine breed of horses. In the greater part of its course the Peneius is shallow and sluggish, except after the melting of the snow, when it occasionally floods the adjacent country. It flows through the famous vale of Tempe. Despite oppressive taxation, the want of railways and good roads, and the depredations of brigands, T. under the Porte is still a richly productive country. In 1874 it yielded 375,000 quarters of wheat, 90,000 of barley, 12,000 of rye, 90,000 of Indian corn, 12,500 of sesame seed, 2,800,000 lbs. of sheep's wool, 276,000 of cotton wool, 275,000 of silk cocoons, and 1,600,000 of tobacco (4,125,000 lbs. in 1873). Large quantities of butter, cheese, of various kinds of pulse, of green and dried fruits, wine, olive-oil, cattle, skins (sheep, goat, and lamb), charcoal and firewood, are also despatched to the markets of Greece, Egypt, Smyrna, Constantinople, and Salonica. The chief town is Larissa, and the principal port Volo (q. v.).

History.—T. is said originally to have been known as Pyrrha, Æmonia, and Æolis. The first two names, however, belong to mythology, while the last was derived from the Æolian Pelasgi, who were expelled from the land by the Thessalians. The latter people are said to have been immigrants from Thesprotia in Epirus. Homer, who does not use the name T., speaks of the sons of Thessalus, the son of Hercules (*Il.* ii. 676). It was early divided into four tetrarchies—

Thessaliotis, Pelasgiotis, Histiæotis, and Phthiotis — which were nominally united under a chief magistrate called Tagus, who seems only to have been appointed in time of war. But the cities, upon which the smaller towns were dependent, administered their own affairs. The three most important, Larissa, Pharsalus, and Pheræ, while torn by internal faction, were often at feud with one another. Hence T. never attained a position in Greek history corresponding to its population and wealth. Philip of Macedon conquered T., which remained under the Macedonian kings till the battle of Cynoscephalæ (B.C. 197) brought it under the sovereignty of Rome. In the constitution of the empire after the time of Constantine, T. appears as a separate province administered by a præses. Since 1460 it has belonged to the Porte. Under the treaty of Berlin (13th July 1878) the Porte is recommended to give Greece an extension of territory in T. and Epirus. For a long time the country has been in a disturbed state, and Greek troops have been massed on the frontier.

Thet'ford, a town on the S. border of Norfolk, England, on the Little Ouse, 31 miles S.W. of Norwich by rail. It has three churches, St. Peter's, St. Mary's, and St. Cuthbert's (restored 1875). Other buildings are the guildhall, mechanics' institute, and a grammar-school, which is now (1879) being rebuilt. Malting is the chief industry, but there are a paper-mill, a tannery, and several machine factories. There is also a large river traffic, chiefly in agricultural produce. Pop. (1871) 4166. A line to Bury St. Edmunds was opened in 1876, and in 1877 new waterworks were constructed, supplied by an artesian well 160 feet deep. T., the Roman *Sitomagus*, was capital of East Anglia, and in later times the seat of a bishop. See Hunt's *History of T.* (1870).

Thet'is, daughter of Nereus and Doris, and wife of Peleus, by whom she became the mother of Achilles. Her marriage was honoured by the presence of all the gods. Poseidon and Zeus are said to have sought her in marriage, but to have desisted when Themis declared that the son of T. would be greater than his father.

Thian'-Shan' ('celestial mountains'), a lofty chain in the heart of Central Asia, extends for 6000 miles from Karakali in the S.W. to Barakul in the N.E., increases in breadth from E. to W., sending off various spurs at right angles, among them Terek-Tagh, Alexander range, Transilenian, Atalan, &c. On the W. shore of Lake Issik-Kul the main range has a breadth of 900 miles. In the central part the peaks attain a height of 24,000 feet, and the passes, which are about 19,000 feet high, are partly covered with glaciers (*e.g.*, the Musart). Little is yet known of the geological structure of the T., but, according to recent accounts, the formation in the N.W. is Palæozoic. Granite and syenite are widely distributed, and together with white dolomitic limestone are found metamorphic schist and dark limestone. Active volcanoes are unknown, but there is an extinct crater near Urumsci, near the centre of the range. See Sewerzow, *Erforschung des T.-S. Gebirgessystems* (Gotha, 1875); Von Richthofen, *China* (Berl. 1877); Petermann's *Mittheilungen* (vol. vi. p. 236, 1878); and Prejevalski, *From Kulja across the Tian-Shan to Lob-nor* (Lond. 1879).

Thi'baudeau, Antoine Claire, Comte, was born at Poitiers, 23d March 1765, and became an advocate in 1789. He took some part in the Revolution, but was not a fanatical republican. Named by Bonaparte a member of the Council of State, he helped to draw up the Code Napoléon, was made Prefect of the department of Bouches-du-Rhone (23d April 1803), and a Count in 1809. In 1815, though he had disapproved the return of Napoleon, he yet opposed the recall of the Bourbons, and was banished. He travelled about Switzerland, Germany, &c., till 1830, when he returned to Paris, but lived in retirement till Louis Napoleon's *coup d'état*, after which he was named in the first list of members of senate, and was created a grand officer in the Legion of Honour, 11th August 1853. He died 8th March 1854. T.'s voluminous writings include his *Recueil des Actes héroiques et civiques des Républicains Français* (1795), *Mémoires sur le Consulat, par un ancien Conseiller d'État* (1826), *Histoire Générale de Napoléon Bonaparte* (6 vols. 1827–28), unfinished; *Le Consulat et l'Empire* (10 vols. 1835–38), *Histoire des États Generaux* (1843). His *Mémoires*, 1765–92, appeared at Paris in 1875.

Thick-Knee (also named 'Stone Curlew' and 'Norfolk Plover') is a *Grallatorial* or wading bird, the *Œdicnemus crepitans* of ornithologists. The T.-K. is allied to the Plover (q. v.). Its colour is brown, variegated with black, the head brown streaked with black, the chin and the under parts white. The average length is 17 inches. The bird is common in the flat lands of Norfolk from April to September. The eggs number two, and are of a light brown marked with slaty blue.

Thielt, a town of Belgium, province of W. Flanders, 20 miles W.S.W. of Ghent by rail, has some manufactures of linen, oil, &c. Pop. (1876) 10,209.

Thierr'y, Jacques Nicolas Augustin, born at Blois, 10th May 1795, from the college of his native town passed to the École Normale at Paris (1811). In 1813 he became a teacher at Compiègne, but within a twelvemonth returned to the capital, where as disciple and secretary he aided St. Simon (q. v.) in various socio-political brochures, and independently published *Des Nations et de leurs Rapports matériels* (1816). He next turned journalist, and in 1820 contributed to the *Courrier Français* ten *Lettres sur l'Histoire de la France* (1827; new ed. 1870). To history his attention had been turned by the reading of Scott's romances, and *Ivanhoe* suggested his *Histoire de la Conquête de l'Angleterre par les Normands* (1825; new ed. 1877; Eng. trans. 1825 and 1847). This, T.'s masterpiece, cost him his eyesight (1826), thenceforth he could only study with the aid of secretaries, friends, and the faithful wife, Julie de Querengal, whom he married in 1831 and lost in 1844. To the period of his blindness belong the *Dix Ans d'Études historiques* (1834; new ed. 1868), *Recits des Temps Mérovingiens* (1840; new ed. 1877), and *Essai sur l'Histoire de la Formation et des Progrès du Tiers État* (1853; new ed. 1868), all three translated into English. He was also one of the editors of the important *Récueil des Monuments inédits de l'Histoire du Tiers État*. Elected a member of the Academy in 1830, T. died at Paris, 22d May 1856.—His brother, **Amédée Simon Dominique** (born 2d August 1797, died 26th March 1873), was likewise a Liberal and an historian. Among his works were *Histoire de le Gaule sous la Domination Romaine* (1826), *Histoire des Gaulois jusqu'à la Domination Romaine* (1828), *Histoire d'Attila et ses Successeurs* (1856), and *St. Jérome* (1867).

Thiers, a town of France, department of Puy-de-Dome, on the Durolle, 25 miles E.N.E. of Clermont-Terrand by rail. It has a college, a technical school, chamber of commerce, &c., and is a great centre of the cutlery trade, which employs 12,000 men. There are also manufactures of paper, iron wares, asphalt, playing-cards, leather, &c. Pop. (1876) 11,182.

Thiers, Louis Adolphe, French statesman and historian, was born at Marseille 15th April 1797, his father being a poor workman, while his mother belonged to a bourgeois family almost equally poor, though remotely connected with the famous Chéniers. After studying as a bursar at the Lyceum of his native town, he went through a course of legal study at Aix and became an *avocat* in 1819. It is said that during his residence at Aix the Academy of that town offered a prize for an essay on Vauvenargues, upon which T. wrote two essays, taking up the subject from different points of view, gaining the prize for one of them, while the other obtained the second place. It was here that he formed a friendship with a brother historian Mignet, along with whom he began life in Paris in 1821, living in a miserable garret near the Palais-Royal. He soon obtained work as a political writer on the staff of the *Constitutionnel*, then the leading journal of the Opposition in Paris, and began to force his way in political circles, where the intimacy which he acquired with such men as Talleyrand, General Jomini, and the financier Louis, was of the greatest use to him in the preparation of his *Histoire de la Révolution Française*, begun in 1823 (in collaboration at first with Felix Bodin) and finished in 1827. This great work may be said to have marked the commencement of the Liberal reaction, in whose sequel T. took such a prominent part. It told the story of the great crisis clearly, calmly, graphically, and in the main accurately, and it neither attacked nor apologised for the principles of the Revolution, but simply took them for granted. Leaving the *Constitutionnel*, T., along with Armand, Carrel, and Mignet, founded a still more outspoken organ of liberalism in the *National*, whose first number appeared on

January 1, 1830. In it he waged war against the Polignac ministry, and in it appeared his famous definition of the duties of a constitutional monarch, *Le roi règne et ne gouverne pas.* The ordinances against the press which brought about the Revolution of July 1830, were answered by a protest drawn up by T. and signed by 43 Parisian journalists which was in fact the real signal for insurrection. After the Revolution T. attached himself to the Orleanist or Constitutional party, headed by Laffitte, and on the accession of Louis Phillipe he became a Councillor of State, was attached to the finance department, and entered the Chamber of Deputies, where, though his *début* was not very successful, his calm, incisive, and perspicuous oratory soon made him a power. He obtained the post of Minister of the Interior in Soult's cabinet of 1832, and afterwards held the office of Minister of Commerce and Public Works, then returned to the Ministry of the Interior, and in consequence of some difference with Soult resigned his portfolio on the 11th November 1834. A ministerial crisis followed, and in a week T. found himself reinstated in his office under the leadership of Mortier. From this time forward there was a breach between Guizot and T., who had hitherto worked apparently in accord. From February to August 1836, T. was at the head of the ministry, but differing from the king upon Spanish affairs he resigned his position, and did not again hold office until 1st March 1840, when he became President of Council and Minister of Foreign Affairs. He had been elected a member of the Academy in 1836. Immediately on his accession to power ensued the Eastern complications which led to the bombardment of Acre by the English, and the expulsion of Mehemet Ali from Syria. At this crisis T. placed himself in opposition to the policy of Lord Palmerston and the rest of Europe, menaced Germany with an extension of the French frontier to the Rhine, and at last, finding the king strenuously opposed to his warlike designs, gave in his resignation on the 29th of October 1840. He now retired into private life, occupying himself with his *Histoire du Consulat et de l'Empire*, published at intervals between 1845 and 1860. After the Revolution of 1848 he re-entered public life, exerting himself in the chamber against the Socialist tendencies of the crisis, and labouring openly for a restoration of the Orleans family. The *coup d'état* of 1851 led to his banishment, but he was soon permitted to re-enter France, where for the next ten years he occupied himself exclusively with literary and artistic pursuits. Re-entering the chamber in 1863, he became one of the leaders of the opposition, denounced from the commencement the war of 1870, and predicted its disasters. When his predictions were verified, he was once more brought prominently to the front in political life, and though he refused a place in the Government of National Defence, he rendered signal service in the committee for the defence of Paris. On the 12th of September he started on a diplomatic mission to London, Vienna, St. Petersburg, and Florence, from which he returned with nothing but empty promises of intercession on the part of the governments to whom he had applied for military aid, or at any rate authoritative intervention. Equally unfortunate were his negotiations with Prince Bismarck on the subject of an armistice, which lasted from the 30th October to the 6th November, and were at last broken off on account of Prince Bismarck's refusal to consent to the revictualling of Paris. After keeping himself in the background during the terrible winter of 1870–71, he was, on the summoning of the National Assembly, elected to it by no less than 26 departments, and became the head of the Provisional Government. In this position his energy and practical good-sense were of the greatest service in the peace negotiations with Germany, and in the perilous days of the Commune which followed close upon them. On the 31st of August 1871 his position at the head of the Government was ratified, and he was granted the title of President of the French Republic by a majority of 491 to 93. This post he held until the parliamentary crisis of May 24, 1873, when he was succeeded in the Presidency by Marshal Macmahon, and for the last time retired into private life. He died at his residence, St. Germain-en-Laye, 3d September 1877. T.'s mind was not of the very highest order, and he does not stand quite in the first rank either as a statesman or as an historian. He has been accused of a fatalistic worship of success, both in his philosophy as set forth in his writings, and in the practice of his life, but of this foible his consistent opposition to the Empire should in a great measure free his memory. Perhaps a keen practical sagacity, and a species of common-sense too seldom found among his compatriots, were his leading qualities, and it is certain that they enabled him to do his country most signal service in her direst straits. See A. Laya's *Études historiques sur la Vie privée, politique, et littéraire de M. A. T.* (Par. 1846), the same author's *Histoire Populaire de M. A. T.* (Par. 1872), the Biographies by Eggenschwyller (Bern 1878) and Frank (Par. 1877), Nassau W. Senior's *Conversations with M. T., M. Guizot, &c.* (Lond. 1878), and Jules Simon's *Gouvernement de M. T.* (2 vols. Par. 1878; Eng. Trans. 2 vols. Lond. 1879).

Thiersch, Friedrich Wilhelm, born at Kirchscheidungen, near Freiburg-an-der-Unstrut, June 17, 1784, studied theology and philology at Leipzig and Göttingen, and in 1809, following a call to the newly-founded Munich Lyceum, there founded a Philological Institute. The enthusiasm T. had shown in the German War of Liberation he presently directed to Hellenic regeneration, and in 1831 visited Greece, where on the murder of Capo d'Istria he co-operated towards the election of Otto of Bavaria to the throne. Returning to Munich, he was elected President of the Academy in 1848, and died February 25, 1860. Among his works were a *Griechische Grammatik* (1812), *Ueber Gelehrte Schulen* (3 vols. 1826–30), *De l'État Actuel de la Grèce* (1833), and *Ueber die neuesten Angriffe auf die Universitäten*. See *Friedrich T.'s Leben*, by his son (2 vols. Leip. 1866–67).

Thi'onville (Ger. *Diedenhofen*), a small fortified town of Germany, in Lothringen, on the Moselle, 18 miles N. of Metz by rail. It was taken by the Germans after a bombardment of two days, November 24, 1870. Pop. (1875) 7168.

Third, a musical interval. From C to E (four semitones) is a major T., from C to E♭ (three semitones) a minor T., from C to E♯ an augmented T., and from C to E♭♭, or from C♯ to E♭, a diminished T.

Thirl'age, in Scotch law, is a Servitude (q. v.) under which the proprietors are bound to have the grain produced on their lands ground at a particular mill, and to pay certain duties specified in the title. The principal duty is *multure*, which varies from about one-thirtieth to one-twelfth of the grain carried, or of the flour made. It is payable to the proprietor of the mill, or to his tenant. There are several minor duties. In England there is on some lands a custom to the same effect, but it is not general.

Thirl'wall, Conn'op, born at Stepney, 11th January 1797, at three learnt Latin, at four 'read Greek with ease and fluency,' and in 1809 figured as author of *Primitiæ*, a volume of sermons, tales, and verse. Charterhouse strengthened his precocious growth, and as scholar with Whewell, Sedgwick, and Julius Hare of Trinity College, Cambridge, he carried off the Craven, Bell, and senior chancellor's medal, and having graduated as a senior optime—there was then no classical tripos—was elected to a college fellowship (1819). His translation of Schleiermacher's *St. Luke*, introducing 'rationalism' to English theology, was made while he was a law student at the Temple, and he was actually called to the bar in 1825, the year when we find him one of a debating society whose members included Mill, Maurice, Macaulay, Sterling, the Bulwers, and Wilberforce. A Trinity tutorship, however, led to his taking orders and return to Cambridge, where with Hare he translated Niebuhr's *History of Rome* (1828), and became a joint-editor of the *Philological Museum* (1832–33), to it contributing among other essays on the widest subjects one, singularly subtle and profound, on *The Irony of Sophocles*. His *History of Greece* (1835–40; new and enlarged ed. 1856) was written under great disadvantages for 'Lardner's Cyclopædia,' and has been partly eclipsed by Grote's, but was the first (and last) Greek history that, rising above the school-book level, betrays no trace of party animus, whilst from its learning, accuracy, and dignified if passionless style, it must always rank as an English classic. His pamphlet on the *Admission of Dissenters to Academical Degrees* (1834) cost him his tutorship, but was rewarded by the Whig Government with the living of Kirkby-Underdale, and in 1840 Lord Melbourne raised him to the see of St. David's. In six months' time he could preach to Welshmen in the Cymric tongue, out of his revenues he expended in thirty years £30,000 on the augmentation of poor livings, and a long list might be formed of churches and schools built or enlarged through his munificence. But T.

is chiefly known to the outside world by his public utterances, the eleven Charges (1842-72), which, whether on Tractarianism or the Gorham controversy, Ritualism or *Essays and Reviews*, were always marked by a judicial fairness and that rarest quality of common-sense. The Liberal representative of the Bishops' bench, he stood alone or almost so in his attitude towards the removal of Jewish disabilities, the Maynooth Grant, Colenso's inhibition, and Irish Church disestablishment, while in Convocation he held the balance of opinion. Having resigned his see in 1874, he died at Bath, 27th July 1875, and was buried in Westminster Abbey side by side with Grote. The Rev. J. Perowne has edited his *Remains, Literary and Theological* (3 vols. Lond. 1877), which, comprising T.'s charges, sermons, speeches, and miscellaneous writings, will some day, says Professor Sayce, 'take a place in Anglican literature beside Hooker's *Polity*, the *Liberty of Prophesying* of Jeremy Taylor, or Butler's *Sermons*.' See the *Edinburgh Review* (April 1876) and *Theological Review* (April 1878).

Thirsk, a town of England, N. Riding of Yorkshire, in the vale of Mowbray, on the Cod Beck, a tributary of the Swale, 22½ miles N.W. of York by rail. It is divided by the Cod Beck into Old and New T., and a little to the S. is the suburb of Sowerby. The Mowbrays were a powerful baronial family here in the time of Richard I., and the church, a fine Perpendicular building, with a lofty tower and a splendid Irish oak roof, was gifted by Roger de Mowbray to Newbury Priory. A water company has been formed (1879) to convey 300,000 gallons daily from Boltby, 7 miles off. T. returns a member to Parliament. Pop. (1871) 5734.

Thirst, a term used to denote the sensations arising from the want of fluid nutriment. These sensations are chiefly referred to the thorax and fauces, but the condition of T. is really one affecting the entire body. A proof of this is that while moistening the fauces temporarily relieves T., it is permanently relieved by the introduction of liquids into the blood, either through the stomach or by direct injection into the blood-vessels. The excessive pains of T. compared with those of hunger are due to the fact that the deprivation of liquids is a condition with which all the tissues sympathise, so to speak. Every solid and every fluid of the body contains water, and hence abstraction or diminution of the watery constituents of the blood is followed by a general depression of the entire system.

Thirty Years' War, The, had its origin in the feeble efforts of Ferdinand I. to conciliate and of Rudolf II. to crush the Protestants, in the rise of the Jesuits to power, and in the formation of the Protestant Union by Christian of Anhalt and of the Catholic League by Maximilian of Bavaria, which divided Germany into two hostile camps. The violation of Rudolf's concession of religious liberty by Ferdinand II. (q. v.) led the Bohemians to elect in his stead Friedrich V. of the Palatinate, and the great drama opened, whose acts with their chief actors were as follows:—*Bohemian War* (1618-20), with Tilly (q. v.) *versus* the 'Winter King;' *War of the Palatinate* (1621-24), with Tilly *v.* Mansfeld, Friedrich of Baden, and Christian of Brunswick; *Dano-Saxon War* (1624-30), with Tilly and Wallenstein (q. v.) *v.* Mansfeld and Christian IV. (q. v.) of Denmark; *Swedish War* (1630-32), with Tilly and Wallenstein *v.* Gustaf Adolf (q. v.) of Sweden and Bernhard of Weimar; *Franco-Swedish War* (1632-48), with Ferdinand III. (q. v.), Wallenstein (till 1634), the Elector of Bavaria, and the Elector of Saxony (from 1635) *v.* Oxenstjerna (q. v.), Bernhard, Georg of Brunswick-Lüneburg, Richelieu (q. v.), Condé (q. v.), and Turenne (q. v.). The strife, which ruined the Holy Roman Empire and cost the lives of two-thirds of the German population, was ended by the unsatisfactory Peace of Westphalia, 24th October 1648. By it religious equality was established and Church property left as prior to 1624; the independence was recognised of Switzerland and the United Provinces; France received Austrian Elsass, and was confirmed in the possession of Metz, Toul, and Verdun; Sweden, acquiring Wismar and Stettin, Western Pommern, and the sees of Bremen and Verden, became a member of the German Diet; and the Electors of Bavaria and Brandenburg were largely profited. See, besides the histories of Schiller (2 vols. 1808-9), Söltl (3 vols. 1840-43), Gindely (3 vols. Prague 1869-78), &c., Gardiner's *T. Y. W.* (Lond. 1874), Charvériat's *Histoire de la Guerre de Trente Ans* (Par. 1878), and Ritter's *Brief- und Acten zur Geschichte des dreissigjährigen Krieges* (4 vols. Mun. 1878).

This'tle is the name given to a number of plants of the *Cynareæ* tribe *Compositæ* which have spinescent bracts and spinous-toothed leaves. The genus *Carduus*, with its subgenera *Cirsium* or *Cnicus* and *Silybum*, contains the greater number of those commonly recognised. This genus numbers about 160 species of erect herbs with heads of purple or white tubular flowers surrounded by many imbricated, appressed, narrow, rigid, acuminate, or spinous-tipped bracts, and usually bearing spinous-toothed leaves. The genus is chiefly confined to Europe and W. Asia, although some of the species have been accidentally introduced into other regions. Twelve are natives of Britain. Of these the most common are the spear T. (*C. lanceolatus*), a stout plant of 3 to 4 feet high, with leaves, bracts, and winged-stem bearing strong spines; it is abundant in waste ground; *C. arvensis*, the very common creeping T. of fields and roadsides, and a great pest of agriculture; and *C. palustris*, a stout biennial species of wet meadows, ditches, &c., with a winged-stem 2 to 4 feet high (formerly eaten). The musk T. (*C. nutans*), with large solitary hemispheric drooping heads of crimson flowers having a musky smell, is locally plentiful in waste ground; so also is *C. crispus* on dry banks, &c.; *C. tenuiflorus* in sandy places near the sea; and over a less area the stemless T. (*C. acaulis*), and the *C. pratensis* in boggy meadows. The tall, handsome, woolly-headed T. (*C. eriophorus*), with heads 2 to 3 inches in diameter, though widespread in Europe, is rare as an English plant, being mostly confined to limestone soil; its young parts are eatable both as salad and cooked. The conspicuous melancholy T. (*C. heterophyllus*) of moist sub-alpine pastures was formerly used for hypochondria. *C. Marianus*, the milk T., a glabrous plant having large white-nerved leaves with strong spines, globose heads of rose-purple flowers, with a long terminal spine to each bract, is common in S. and middle Europe. It also bears the name of 'Our Lady T.,' from the legend of the leaves being marked white by her milk. The blessed or holy T. is *C. benedictus*, a native of the Orient, but now widely distributed. It was long held in esteem as a tonic, diaphoretic, antidote against venom, &c. In genera held by botanists as distinct from *Carduus*, the name cotton T. is adopted for *Onopordon Acanthium*, a stout hoary or cottony biennial 4 to 5 feet high, commonly called by Scotch gardeners the Scotch T. The Carline T., or *Carlina vulgaris*, is frequent in dry sandy pastures and coast ground.



Carduus Marianus.

This'tle, Order of the, or of St. Andrew, a Scotch order of knighthood, instituted by James VII. (II. of England), May 29, 1687. It fell into abeyance in the reign of William and Mary, but was revived by Queen Anne, December 31, 1703.

This'tlewood Conspir'acy, a conspiracy formed in London in 1820 to assassinate the ministers of the Crown at a cabinet dinner, and excite an insurrection in the city, so called from the name of its ringleader, Arthur Thistlewood, a profligate whom ill-fortune had rendered desperate. The plot was discovered by a government spy, and the conspirators were seized in a garret in Cato Street, February 23, the day fixed upon for the execution of the project. Thistlewood and four others were executed, May 1, 1820.

Tho'len, an island of the Netherlands, in the province of Zeeland, lying N. of the Ooster Schelde. Area, 51 sq. miles; pop. 11,600. T. has a rich soil, and is protected by dykes. Wheat, rye, barley, oats, flax, madder, beans, and potatoes are its products. T., the chief town, has a pop. (1877) of 2741.

Tho'luck, Friedrich August Gottreu, a German Protestant theologian, was born at Breslau, March 30, 1799. He studied Oriental literature and theology at the universities of Breslau and Berlin, at which latter place he was appointed extraordinary professor of theology in 1824. In 1826 he was appointed ordinary professor at Halle, a post which he filled with usefulness and honour for half a century. He died 10th June 1877. T. wrote a large number of works, principally on theological

subjects. The chief are *Suffismus sive Theosophia Persarum Pantheistica* (Berl. 1821); *Blütensammlung aus der Morgenländischen Mystiker* (1825), *Wahre Weihe des Zweiflers* (1823, 9th ed. 1870), *Auslegung des Briefes an die Römer* (Berl. 1824), *Praktische Commentar zu den Psalmen* (Ham. 1843), *Philosophisch-Theologische Auslegung der Bergpredigt*, an exposition of the Sermon on the Mount (5th ed. Gotha 1872), *Glaubwürdigkeit der Evangelischen Geschichte* (Hamb. 1837), a reply to Strauss's 'Leben Jesu,' *Vermischte Schriften* (2 vols. Hamb. 1839). T. also wrote several volumes on the history and doctrines of the Lutheran Church, part of a history of Rationalism, and a number of sermons (5 vols. Gotha 1863–64), which are distinguished by a fervid though somewhat diffuse and even turgid eloquence. His most widely-circulated work was his *Stunden der Christlicher Andacht* (Hamb. 1840, 8th ed. Gotha 1870; translated as *Hours of Christian Devotion*, by Menzies, Edin. 1870). A complete edition of his works appeared at Gotha (11 vols. 1863–67). T. was a man of very wide rather than very deep learning. He preferred the general study of the whole vast field of theology to confining himself to a particular portion of it. He was for long the acknowledged leader of the orthodox party, a post for which a rare combination of piety, knowledge, and benevolence of disposition admirably fitted him. He was not above learning from his opponents, and in later life especially he no longer held by the extreme positions of the old school. For English translations of T. see Clark's *Biblical Cabinet*, vols. ii., v., vi., xii., xx., xxviii., xxxviii., xxxix., and Clark's *Foreign Theological Library*. See Kähler, *A. T., ein Lebensbild* (Halle 1877).

Thom, James, a self-taught sculptor, was born in Ayrshire in 1799. While still an obscure stone-cutter, he suddenly became famous by a group representing 'Tam o' Shanter and Souter Johnny,' and cut in the common sandstone on which he was accustomed to work. It is a miracle of dramatic vigour and artistic skill. This group, which now adorns the 'Burns Monument' at Doon, near Ayr, was first exhibited in Edinburgh in November 1828. Orders flowed in on the gifted sculptor, who removed to London, whence in 1837 he sailed for the United States, where he settled, and where his genius found a liberal recognition. T. died of consumption at New York, 17th April 1850.

Thom, William, a humble but genuine Scottish poet, was born in Aberdeen in 1799. His life is a sad record of unavailing struggles with miserable poverty. Sent to earn his bread in a factory at the age of ten, he became, after a four years' apprenticeship, a weaver in his native town, and worked there for seventeen years. Then he removed to Newtyle in Forfarshire. In 1837 some great failures in America caused the stoppage of 6000 looms in Dundee and the villages round about. T. was forced to wander about with a young family, 'houseless and penniless, deriving his only subsistence from his flute.' During a dismal expedition through Fife in search of work, one of his children 'died from want in an unsheltered outhouse.' At last he found employment at Inverurie. While here he wrote his *Mitherless Bairn*, a poem which is instinct with a deep feeling for cheerless misery, and which has drawn tears from the coldest hearts. T. died at Hawkhill, near Dundee, February 28, 1848. His poems were collected and published in one volume in 1845; a new edition is promised (1879) by Gardner of Paisley.

Thom'as, St. See St. Thomas.

Thom'as, George Henry, a distinguished general in the American Civil War, was born in Virginia, July 31, 1816. In 1836 he became a cadet at the U.S. Military Academy, graduated there in 1840, after which he served in Florida against the Indians, in the war against Mexico, and for five years in Texas. In November 1860 he returned to the East, and on the outbreak of the Civil War immediately placed his sword at the service of the Federal Government. He commanded a brigade at the battles of Martinsburg (July 3, 1861) and Bunker Hill (July 15). In November he received a command in the army of the Ohio, and contributed greatly to the important victory at Mill Springs (January 19–20, 1862). On the advance into Kentucky, he was appointed second in command of the army of the Ohio, and led the right wing in the battle of Perryville (October 8). During 1863, in the battle of Murfreesboro', T. led the centre of the army under General Rosecranz, and at the battle of Chickamauga he sustained a five hours' struggle against overwhelming forces, and alone prevented the defeat of the Federal army. On October 27 he received his commission as brigadier-general in the regular army, and during the campaign of 1864 he served under General Grant. On the 27th September of that year he was placed in chief command in Tennessee, where he was successful in out-manœuvring General Hood, and inflicting a severe defeat upon him at Franklin (November 30). On the 15th and 16th December he completely defeated Hood, destroying his army, for which he was thanked by Congress and voted a gold medal by the State of Tennessee. In 1869 T. commanded the military division of the Pacific, with headquarters at San Francisco, where he died, March 28, 1870.

Thom'as, Christians of St., are a community which existed in India, on the Malabar coast, from a very early date. According to tradition, the gospel was preached in India by St. Thomas the Apostle; but this Christian community was probably founded by refugees from the persecution which took place after the settlement of the Monophysite (q. v.) controversy in the 5th c. When the Portuguese arrived in India (1598) they found the C. of St. T. governed in temporal as well as in spiritual matters by the bishop of Angamala, who claimed the title of Metropolitan of India, and had actually the oversight of 1400 churches and a population of 200,000. They used the Syriac liturgy, and regarded themselves as the spiritual subjects of the Jacobite patriarch of Antioch. They stoutly maintained their peculiar (Nestorian, q. v.) opinions notwithstanding all the zeal of the missionaries who flocked in the rear of the Portuguese, and in consequence suffered much persecution at the hands of the Jesuits. They were nominally united with the Church of Rome in 1599, and remained so for sixty years till the Portuguese were expelled by the Dutch, when they returned to their ancient creed and worship. In 1830 there was a remnant of 60,000 or 70,000, but as they have been diligently attacked since then by the Church of England and other missionary societies, their peculiarities are rapidly being obliterated. See Geddes, *Hist. of the Malabar Church* (Lond. 1694).

Thoma'sius, Christian, a famous German jurist, was born at Leipzig, January 1, 1655, entered on a course of study there at the age of fourteen, from which he passed in 1675 to the study of philosophy and law at Frankfurt, where he graduated as doctor in 1679. After a short residence in the Netherlands, he returned to Leipzig to prosecute the profession of an advocate, but was soon afterwards called to a chair in the university. In his lectures he boldly declared war against the puerility and pedantry of the old methods of teaching, while in 1687 he introduced the startling innovation of reading his lectures in the vulgar tongue. The boldness of his attacks, and the powerful sarcasm with which he punished his opponents, procured him many enemies, whom his monthly review, *Freimüthige, lustige und ernsthafte, jedoch vernuft- und gesetzmässige Gedanken, oder Monatsgespräche über allerhand vornehmlich aber neue Bücher*, (commenced 1687), gave him a means of chastising. At last he was compelled to leave Leipzig and seek an asylum at Berlin. He was kindly received by Friedrich III., the great Elector of Brandenburg, and appointed to a lectureship in the Ritterakademie at Halle. On the establishment of the university at Halle in 1694, T. received the chair of jurisprudence, which he retained until his death, September 23, 1728. T. exercised an important influence on the German mind of his own day, and gave the deathblow to the pedantic terminology by which jurisprudence had been obscured. He insisted particularly on separating natural right from morality, and vigorously opposed trials for witchcraft and punishment by torture. Of his numerous works the most important are *Einleitung zur Vernuftlehre* (1691), *Einleitung in die Sittenlehre* (1692), *Natur- und Volkerrecht* (1705), *De Crimine Magiæ* (1701), and *Lehrsätze vom Laster der Zauberei* (1704). See Luden, *Chr. T. nach seinen Schicksalen und Schriften* (Berl. 1805); and B. A. Wagner, *T., ein Beitrag zur Würdigung seiner Verdienste um die deutsche Literatur* (Berl. 1872).

Tho'mists. See Aquinas.

Thom'pson, Thomas Perronet, was born at Hull, England, in 1783, and in 1798 entered Queen's College, Cambridge, where he graduated B.A. in 1802. After a short time spent in the navy, he entered the army and saw some service abroad, being

governor of Sierra Leone from 1808-12. After brilliant service in the Peninsular campaigns from 1812-15, and in India from 1815-21, he returned to England, left the army with the rank of lieutenant-colonel, and appeared as a political writer of advanced views. He advocated the repeal of the corn-laws, and co-operated in the establishment of the *Westminster Review*, besides publishing several treatises on music and geometry. In 1829 he retired on half-pay as lieutenant-colonel. He became M.P. for Hull, 20th June 1835, and for Bradford, March 1857. He died September 6, 1869. His chief works are, *Corn Law Catechism* (1827); *Enharmonic Theory of Music* (1829); *Geometry without Axioms* (1830); *Exercises Political and Otherwise*, a collection of fugitive pieces made by himself (1843); *Catechism on the Currency* (1848); *Theory and Practice of Just Intonation* (1850).

Thom'son, Andrew, D.D., was born at Sanquhar, in Dumfriesshire, Scotland, July 11, 1779. In 1802 he became minister of the parish of Sprouston, in the Presbytery of Kelso; in 1808 he removed to Perth; in 1810 was presented to New Greyfriars', Edinburgh; and in 1814 was translated to the new church of St. George's in that city. He died February 9, 1831. T. was remarkable for his eloquence both as a preacher and a platform speaker; took an active part in church discussions, more particularly in regard to the *Apocrypha;* worked hard in his parish for the improvement of the education of the poorer classes; founded and edited the *Christian Instructor;* and contributed a number of articles to Brewster's *Edinburgh Cyclopædia*. A vol. of his *Sermons and Sacramental Exhortations* was published in 1831, with a memoir prefixed.

Thom'son, James, an English poet, was born September 11, 1700, at Ednam, a village not far from the town of Kelso, in Roxburghshire. Intending to follow his father's profession, he began to study divinity at the university of Edinburgh, but his purpose gradually changed, and in 1725 he made his way with fortunate presumption to London as a candidate for poetic fame. His first volume was *Winter* (1726), and though it brought him no more than three guineas of immediate gain, it laid the foundation of his success. *Summer* followed in 1727, and *Spring* in 1728; and in 1730 there appeared the first complete edition of *The Seasons*, which has ever since maintained its position as the finest example of purely descriptive poetry in the language. It was during these same years that he produced *Britannia* (anonymous 1729), the tragedy of *Sophonisba*, and the poem to the memory of Congreve, which was recovered by H. F. Carey and printed by the Percy Society in 1843. By the recommendation of Dr. Rundle, afterwards bishop of Derry, he was appointed travelling tutor to Charles Talbot, eldest son of the Lord Chancellor; and the political observations which he made on his tour through Europe furnished him on his return with the materials of an unsuccessful poem on *Liberty* (1735). His services to Talbot were rewarded by the office of secretary of briefs; and though he lost his appointment on his patron's death, the deficiency was soon made up by a pension of £100 a year from Frederick, Prince of Wales; and at a later date he was allowed, through Lord Lyttleton's influence, to draw a considerable salary as surveyor-general of the Leeward Isles, while the duties of the surveyorship were discharged by a deputy. Between 1737 and 1740 he wrote a poem in memory of Lord Talbot, edited his own works, furnished a preface to Milton's *Areopagitica*, produced the tragedy of *Agamemnon*, and assisted Mallet in that *Masque of Alfred*, which has become memorable as the source of the national anthem, *Rule Britannia*. In 1745 he brought out the play of *Tancred and Sigismund*, founded on a story in *Gil Blas;* and in 1748 he published his *Castle of Indolence*. This last poem is T.'s most perfect work in point of poetic workmanship, and it proved almost his final effort, for he died at Richmond, August 22, 1748, leaving behind him only the scarce-completed tragedy of *Coriolanus*. In spite of the reputation for indolence which he arrogated and in some sort deserved, in his own department T. was a steady worker; but if it had not been for *The Seasons* and the *Castle of Indolence* his position in our literature would have been a very secondary one. His tragedies are well-nigh forgotten; though the name of *Sophonisba* is probably destined to echo back *Jemmy Thomson* as long as English literature survives. His style is unique, rich, elaborate, and sonorous, with a tendency to grandiloquence which is sometimes carried to gross and grotesque excess. He was a firm believer in 'poetic diction,' and when his heroine takes off her stocking she 'draws the inverted silk.' But flaws of this kind are forgotten in the general effect of his pictures, which are boldly conceived and powerfully drawn. *The Seasons* have been translated into French verse by J. Poulin (Par. 2 vols. 1802), and into German by Soltau (Bruns. 1823, and Bruckbrän Munich 1836). See Lives by Murdoch (1762), Allan Cunningham, and Sir H. Nicolson, the *Miscellanies of the Philobiblon Society*, 1857-58, and an essay by Barante in *Études Hist. et Biogr.* (Par. 1857).

Thom'son, Rev. John, a Scottish landscape-painter, was born in the manse of Dailly in Ayrshire, September 1, 1778. It was in vain that the boy artist pleaded with his father to let him become what nature had made him: he was destined for the church; and so, after studying at the University of Edinburgh, he was duly admitted to the practice of the clerical profession. In 1800 he was appointed his father's successor, and in 1805 he obtained the parish of Duddingstone, near Edinburgh. While a divinity student he had taken lessons in his favourite art from Alexander Naysmith, and he now prosecuted it with such success, that before long he was admitted an honorary member of the Royal Scottish Academy, and found so great a demand for the productions of his pencil, that his annual profits as an artist amounted to £1800. His favourite subjects were castles such as Craigmillar, and Highland scenes such as the Trossachs and Loch Achray. Not only were Sir Walter Scott, Sir Thomas Dick Lauder, and other Scottish celebrities, well-known visitors at the Duddingstone manse, but Turner and other English artists were among the rarer guests. T. died 27th October 1840. His elder brother, **Thomas T.**, also born in the manse of Dailly, 10th November 1768, studied at Glasgow, passed advocate at Edinburgh in 1793, held the office of deputy clerk-registrar (instituted 1806), did good service under the Record Commissioners, edited a number of works for the Bannatyne Club, and contributed to the *Edinburgh Review*. In 1828 he was appointed one of the principal clerks of the Court of Session. He died at Shrubhill, Leith Walk, Edinburgh, 2d October 1852. The list of T.'s publications, given in the *Scottish Nation*, shows the extent and nature of his historical and legal archæology. A sketch of his Life was published by the Bannatyne Club in 1853.

Thom'son, Sir Charles Wyville, F.R.S., an eminent zoologist, was born at Bonsyde, Linlithgowshire, Scotland, March 5, 1830. He began the study of medicine at Edinburgh University in 1845, became lecturer on botany at King's College, Aberdeen, in 1850, was elected professor of natural history at Queen's College, Cork, in 1853, and in 1854 settled at Belfast as professor of mineralogy and geology in Queen's College, a chair which he afterwards united with the natural history chair vacated by Dr. Dickie in 1860. In 1870 he succeeded Allman in the zoology chair at Edinburgh University. He early directed his attention to the lower forms of animal life. The discovery, by G. O. Sars in 1864, of a new *Crinoid* at a depth of 700 feet, convinced T. that the accepted theory that life did not exist in deep water was not by any means established. To settle this point he has taken a leading part in the dredging operations of the government vessels, the *Lightning* (1868), the *Porcupine* (1869-70), and the *Challenger* (1872-76). Besides demonstrating the existence of life at all depths, these expeditions, especially the last, have added many new species of animals, and increased our knowledge of the physical characters of the great oceans. T. was knighted shortly after the return of the *Challenger*. He has written valuable papers on zoological subjects, beautifully illustrated by his own most finished sketches, and is author of *The Depths of the Sea*, giving an account of his two first cruises, and the *Voyage of the Challenger*, the first and second volumes of which, published respectively in 1876 and 1878, treat of the Atlantic. The forthcoming third and fourth volumes are to deal with the Southern Seas and the Pacific.

Thom'son, Sir William, LL.D., D.C.L., F.R.S., perhaps the greatest natural philosopher which this century has produced, was born at Belfast, June 25, 1824. At the age of eleven he entered Glasgow University, where his father was professor of mathematics; and after finishing his course there proceeded to Cambridge, where he graduated in 1845 as second wrangler and First Smith's Prizeman, and was immediately after elected a fellow of his college (St. Peter's). Already he had written a series of remarkable papers on electrical distribution, which were published in the Cambridge *Mathematical Journal;* and in

1845, in a paper before the Royal Society, he pointed out that the experimental results of Snow Harris which were generally accepted as disproving Coulomb's laws of electrical action were on the contrary a strong proof of their truth. About the same time he developed the theory of electrical images; and attacked with great originality and success the subject of electrokinetics. The reputation which he thus early earned secured him the chair of natural philosophy at Glasgow University in 1846, a position which he still holds. His later career has more than fulfilled the promise of his early years; and to enumerate the subjects, experimental and theoretical, which he has elucidated, would carry us over the whole range of physics. Besides his researches in electricity already noticed, his thermodynamic work calls for special mention. In establishing and developing the true theory of heat, and in applying it to other departments of physics, T. holds a wholly unique position. The doctrine of the dissipation of energy (1852), and the discovery of the so-called Thomson Effect (1855), a result which, drawn from consideration of thermo-electric phenomena, was afterwards verified by experiment (see THERMO-ELECTRICITY), are his most important developments of the second law of Thermodynamics (q. v.). His theory of the origin of the solar energy, his calculation of the size of atoms, and his determination of the earth's rigidity, attest his extraordinary power of combining fact and theory to the working out of a given problem. The most wonderful, however, of all his theoretical researches is his vortex-atom theory, which, while explaining many of the properties of matter, has as yet been found inconsistent with none. A popular account of it is given in Tait's *Recent Advances*, and in Stewart and Tait's *Unseen Universe*. His mathematical insight is equalled by his experimental skill, as evinced by the verifications of his theoretical results; and as an inventor of delicate instruments of precision he has certainly never been excelled. His mirror galvanometer, his quadrant electrometer, his tide-gauge, his sounding apparatus, not to speak of his telegraphic transmitters and recorders, are amongst the more important of these. It is in this last connection, as a telegraphist, that T. is perhaps best known to the unscientific public. To him the possibility of submarine telegraphy is in great measure due; and for his exertions in laying the Atlantic cable, exertions which were at length crowned with success in 1866, he obtained the honour of knighthood. The siphon recorder and automatic curb-sender are his latest improvements in telegraphic apparatus. T. is also a skilful navigator; and his tables for using Sumner's method at sea afford a simpler and more accurate means for determining a vessel's longitude than is afforded by the usual methods. In this connection his mariner's compass merits special notice. Its peculiar advantages are steadiness and small frictional error, and the case with which it admits of the application of the corrections for the deviation due to the ship's magnetism, which were laid down by Archibald Smith and Airy. He is a member of the principal scientific societies at home and abroad, was President of the Royal Society of Edinburgh from 1873 to 1878, presided over the Edinburgh meeting of the British Association in 1871, and has been three times president of Section A of that body. His peculiar merit lies not so much in his great mathematical ability, as in the power with which he wields mathematics in purely physical questions, a faculty which is happily combined with a keen scientific insight and a rare experimental skill. His numerous memoirs are published in the *Philosophical Transactions* and the transactions of other societies, and also in the *Philosophical Magazine*, of which he is joint editor with Sir R. Kane and William Francis, Ph.D. With Professor Tait of Edinburgh he has projected an elaborate treatise on *Natural Philosophy*, to be published in four volumes (1 vol. 1867, 2d ed. expected 1879). His *Papers on Electrostatics and Magnetism* were published separately in 1872.—**James T., LL.D., F.R.S.**, an elder brother of the preceding, was born at Belfast about 1816. He graduated at Glasgow in 1837, settled at Belfast, where in 1857 he became professor of engineering at Queen's College, and in 1872 succeeded Rankine in the engineering chair at Glasgow. He has devoted much attention to drainage, irrigation, and agricultural engineering generally, and has invented various forms of turbines, pumps, &c. His deduction from theory of the lowering of the freezing point of water by pressure, experimentally verified by his more illustrious brother, has completely cleared up the long-debated question of glacier motion (see GLACIERS).

Thom'son, Thomas, was born at Crieff, in Scotland, April 12, 1773. After studying at the University of St. Andrews, he succeeded his brother, James Thomson, afterwards D.D., and minister of the parish of Eccles, Berwickshire, as editor of the Supplement to the 3d. ed. of the *Encyclopædia Britannica*, graduated in medicine at Edinburgh in 1799, and was for some years subsequent to 1802 scientific editor of James Mills' *Literary Journal*. He was the first to introduce the use of symbols in chemistry, and to announce Dalton's Atomic Theory, privately communicated to him in 1804, in the 3d ed. of his *System of Chemistry* (5 vols. 1807). In 1818 T. became Professor of Chemistry in the University of Edinburgh, and died at Kilmun, in Argyllshire, August 2, 1852. T. was a very voluminous writer. Besides the works already mentioned, and a vast number of papers in various philosophical journals, he published a *History of the Royal Society of London* (1812); a *History of Chemistry* (1830), and *Outlines of Mineralogy, Geology, and Mineral Analysis* (2 vols. 1836).

Thomson, William, D.D., born at Whitehaven, Cumberland, 11th February 1819, from Shrewsbury School obtained a scholarship at Queen's College, Oxford, and graduating B.A. in 1840, was elected fellow. Ordained in 1842, he preached the Bampton lectures for 1853 on *The Atoning Work of Christ*; in 1855 received the Crown living of All Souls, Marylebone, and the provostship of Queen's College; in 1861 was consecrated to the see of Gloucester and Bristol, and two years later translated to the archbishopric of York. His *Outline of the Necessary Laws of Thought* (1842, 10th ed. 1875) is a text-book in English-speaking universities, and he has further published *Sermons preached in Lincoln's Inn Chapel* (1861), *The Limits of Philosophical Inquiry* (1869), &c.

Thor (Old Eng. *Thunor*, Old High Ger. *Donar*), the son of Odin and Jörd, is in northern Mythology (q. v.) the highest of the Æsir after Odin. He is the strongest of all the gods, and defends Asgard and Midgard against the Jotuns. T.'s kingdom is called Thrudvangar; his palace, Bilskirnir, has 540 rooms, and is the largest in the world. He rides in a car drawn by two he-goats amid thunder and lightning. His mailed hands grasp the hammer Mjölnir, well known of the Jotuns, for many of their skulls has it crushed. When he girds on his Belt of Strength his power is doubled. His wife is called Sif, and his sons are named Modi and Magni.

Thora'cic Duct, the name applied to the tubular structure in which the *absorbent system* of vessels may be said to terminate, and into which the *lacteals* of the intestine ultimately pour their contained fluid. The T. D. thus receives (1) the products of digestion or *chyle* from the lacteal vessels of the intestine, and (2) the *lymph* or fluid, brought as the elaborated waste-matters of the body from the tissues by the *absorbent system* of vessels or *lymphatics*. Being poured into the T. D., these products, which are destined to replenish the blood, and thus renovate the tissues, are in due course poured into the circulation. The T. D. of man exists as a tubular structure attaining a length of about 18 or 20 inches. It extends from the second lumbar vertebra to the root of the neck, where it ends in the angle formed by the junction of the left internal jugular and subclavian veins, into which vessels its contents are therefore poured. At its commencement in the abdomen it exhibits a dilatation, termed the *receptaculum chyli*, which receives the lymphatics of the lower extremities. The T. D. has a flexuous course, and exhibits an irregular or contracted appearance. It is provided internally with valves, preventing the backflow of its contained fluid. Occasionally it divides above into two branches; and a *right T. D.* is normally found as a short trunk attaining about an inch in length, and devoted to the reception of the lymph from the right side of the head and neck, from the right side of the chest and heart, and from other regions on that side of the body. In birds, the right T. D. may be equally developed with that of the left side.

Thor'ax (Gr. *thōrax*, 'a breastplate'), the name applied to that cavity in vertebrate animals formed by the spine, ribs, and breastbone, and in insects and other Arthropoda to the segments intervening between the head and abdomen. In insects the T. is free and consists of three joints. In spiders and Crustaceans the T. is amalgamated with the head to form the *cephalo-thorax*. In Mammalia the T. is completely shut off from the abdo-

men by the *diaphragm* or *midriff*, while in birds and lower vertebrates the T. may be very ill-defined, and freely communicates with the abdomen. In serpents the chest or T. is not completed below by a breastbone, and in fishes also there is no breastbone. In Amphibians (*e.g.*, frogs) in which ribs are wanting a T. may be said to be unrepresented. The T. of man and higher animals is lined by the delicate nervous membrane known as the *pleura*. It contains the heart and lungs as its chief viscera, the main bloodvessels of the body, as also the *œsophagus* or gullet and the *Thoracic Duct* (q. v.) also traversing its extent.

Thor'burn, Grant, born near Dalkeith, Midlothian, February 18, 1773, was in early life a nailmaker, and on account of political troubles removed to New York in 1794. After a chequered career, he became a successful seedsman, and as 'Lawrie Todd' a voluminous writer for periodicals. He acquired a high character for practical benevolence; and the nobility of his disposition, and strange vicissitudes of his life, are faithfully reflected in Galt's novel of *Lawrie Todd* (1830). His works include *Forty Years' Residence in America* (1834), *Men and Manners in Great Britain* (1834), *Fifty Years' Reminiscences of New York* (1845), and *Life and Writings of G. T., Prepared by Himself* (1852). He died at New Haven, January 21, 1863.

Thor'burn, Robert, a Scottish painter, was born at Dumfries in 1818, studied at the Edinburgh Academy from 1833, and three years later proceeded as a miniaturist to London, where he rapidly rose to fame. He adopted a largeness of size as well as of style unusual in miniatures, and in aiming at the higher qualities of oil-painting lost none of the purity, brightness, and transparency peculiar to able paintings on ivory. For many years his portraits, on account of their art not less than the eminence of their subjects, were among the most attractive works exhibited at the Royal Academy, while the long roll of his illustrious sitters included the Queen, the Prince Consort, and many members of the royal houses of France, Germany, Belgium, &c. T. was particularly happy in the treatment of female beauty. He was made A.R.A. in 1848, and died 19th November 1863.

Thor'eau, Henry David, born in Boston, July 12, 1817, graduated at Harvard in 1837, and was a schoolmaster till 1840. An abolitionist who had run into perils by his efforts against slavery, an ardent naturalist, 'who knew,' says his friend Emerson, 'the country like a fox or a bird,' he withdrew in 1845 to a hermitage, built by himself in Walden Wood, and there for two years lived at an annual cost of $70. From this solitude T. emerged to pursue his father's calling of pencil-making at Concord, where he died 6th May 1862. Besides contributing to the *Dial*, *Atlantic Monthly*, and other periodicals, T. published *A Week on the Concord and Merrimack Rivers* (1849) and *Walden, or Life in the Woods* (1854); while after his death appeared *Excursions in Field and Forest* (1863), *Cape Cod* (1865), *A Yankee in Canada* (1866), &c. See W. E. Channing, *T., the Poet-Naturalist* (1873), and Page, *T., his Life and Aims* (1877).

Thor'inum or **Thor'ium** (Th = 23·15), a rare metal, belonging to the aluminum group, and discovered by Berzelius (1828) in thorite. The oxide *thorina* seems to have the constitution ThO, in this differing from alumina, from which it is physically distinguished by its insolubility in the alkalies. The sulphate is sparingly soluble in hot water, from which it is precipitated on boiling. The chloride ($ThCl_2$), a white shining crystalline substance prepared by sublimation of an intimate mixture of thorina and carbon in chlorine, forms double salts with the chlorides of the alkali metals.

Thorn (Pol. *Torun*), a town of Prussia, province of W. Prussia, near the Russo-Polish frontier, on the river Vistula, 115 miles N.W. of Warsaw by the Bromberg-Warsaw railway, is strongly fortified. In the Johanniskirche there is a monument to Copernicus, who was born here. T. was formerly a Hanse town, and has still many houses with fine interiors in the old Hanseatic style. It has steamboat communication by river with Danzig, Stettin, and Berlin. The chief industries are leather and tobacco manufactures, and there is a large trade in timber and corn. Pop. (1875) 18,631. See Zernecke, *Thornische Chronica* (T. 1711 and 1727); Wernicke, *Geschichte T.'s* (T. 1842).

Thorn. See CRATÆGUS, HAWTHORN, and SPINE.

Thorn-Apple (*Datura*), a genus of poisonous *Solanaceæ* (q. v.), with a funnel-shaped, angular, five-lobed corolla, and a four-valved capsular fruit with four compartments. *D. Stramonium*, the best-known species, occurs sporadically in many parts of the globe, appearing in England occasionally as a casual weed on rubbish-heaps and rich waste ground. Gerard mentions in 1599 having received seeds of it for his London garden from Constantinople. It is a coarse, heavy-smelling, wide-spreading annual, with ovate, sinuate, glabrous leaves, large white flowers in the forks of the stem, and ovate, many-seeded capsules, covered with triangular prickles—whence the name T.-A. The ripe seed and leaves are used medicinally in sciatica, lumbago, chronic rheumatism, and other painful diseases, and the leaves are recommended for smoking in asthma. Leaves, flowers, and rootlet-rind are, according to Captain Burton, smoked by Arabs of Central Africa as a sovereign remedy for a like purpose. The active principle is an alkaloid named *daturia*. In India the seeds of *D. fastuosa* are employed as means to commit theft, and also with other criminal intentions; in Ceylon they are generally given to the victim in arrack: the symptoms that ensue are vomiting and a sinking into a state of lethargy, in which state the person sometimes remains for one or two days. *D. alba* or *D. metel* produces similar narcotic, anodyne, and poisonous effects. The Peruvians prepare an intoxicating and delirium-producing beverage from the seeds of *D. sanguinea*. Beautiful arborescent species of *Datura* (or *Brugmansia*) from S. America are cultivated for their ornamental appearance, such as *B. suavolens*, with large fragrant white blossoms, and *B. bicolor* with orange or scarlet ones.

Thorn'back (*Raia clavata*), a species of Ray, so named from the conspicuous row of spines which arm its back and tail. The T. is common on British coasts. It attains a length of 2 feet or more, and is of a brown colour marked with lighter spots above, and white below. The body nearly approaches the rhomb in form, and the muzzle is by no means prominent. The flesh of the T. is somewhat coarse, but nutritious.

Thorn'bury, George Walter, born in London in the autumn of 1828, for a short time studied painting, but ultimately devoted himself to letters, contributed a series of papers on topography to the *British Journal* (1845), and to the *Athenæum* (1851) some chapters on the Crystal Palace, afterwards republished. His works of the next twenty years—a library in themselves—include *Monarchs of the Main* (1855), the fiery *Songs of the Cavaliers and Roundheads* (1857), *Life in Spain* (1859), *Turkish Life and Character Illustrated* (1860), a *Life of Turner* (1861; new ed. 1877), *Wildfire* (1864) and other novels, *Haunted London* (1865), *Criss-Cross Journeys* (1873), and a finely illustrated selection of his *Legendary and Historic Ballads* (1873). Essayist, novelist, lyrist, biographer, traveller, and art-critic, T. was also a successful lecturer; but sank under overwork, and died 11th June 1876.

Thorn'headed Worms, or **Acan'thoceph'ala**, a group of *Scolecida* (q. v.) allied to the *Nematoid* (q. v.) worms, and so named from the armature of the head. They are internal parasites, possessing neither mouth nor digestive system, and having a proboscis armed with hooks. The sexes are distinct. The only distinct genus of T. W. is *Echinorhynchus*, the species of which, in a fully-grown condition, inhabit the digestive system of vertebrates, and occur in fishes, birds, and mammals. The young undergo a metamorphosis. Thus the embryos of *E. gigas*, which inhabit the pig's intestine, are found in the larvæ of the cockchafer.

Thorn'hill, Sir James, an English painter, born in 1676 at Woodland, Dorsetshire, studied his art in Flanders, Holland, and France, and in the school of Le Brun acquired a taste for mythological allegories and lavish ornament. On his return to London his style soon became fashionable, and his brush was in constant request. He spent nineteen years in 'adorning' the great hall of Greenwich Hospital with a representation of 'William the Third giving Peace to Europe,' and surrounded by Queen Mary, the Virtues, Apollo, the Four Seasons, &c.' Among his other works are the decoration of the dome of St. Paul's Cathedral with eight episodes from the life of the Apostle, the decoration of a saloon in Blenheim House, and another at Hampton Court, besides the large pictures he executed at Moor Park. He was knighted by George I. in 1715, and sat in Par-

liament for his native borough from 1719 till his death, which took place at Weymouth 4th May 1734. His daughter Jane became the wife of the illustrious Hogarth.

Thorough Bass. See FIGURED BASS.

Thorp, the Scandinavian equivalent of the Ger. *dorf*, 'a village,' in local nomenclature sometimes stands by itself, *e.g.*, Le Torp, in Normandy; but oftener appears as a suffix, as in Eng. Althorpe, Wilstrop, and Nor. Clitourps. Being Danish rather than Norwegian, this suffix often helps us to determine whence Scandinavian settlers arrived in England; and whilst it is very common in E. Anglia, it occurs very seldom in Westmoreland, but once in Cumberland, and never in Lancashire.

Thorwald'sen, Albert Bertel, the eminent Danish sculptor, was born near Copenhagen, 19th November 1770. His parents were very poor, and he did not receive even the rudiments of an ordinary education. At an early age he entered the Art Academy, where he gained the highest honours. In 1796 he obtained a travelling government pension of £24, and started for Rome. He went by sea, and the voyage took the almost incredible period of eight months, which T. spent in eating, smoking, and sleeping. He refused offers of Italian lessons, and reached Rome quite ignorant of the language, but even his sluggish soul could not resist the influences of the southern sky, and the memories of the past which fill the Eternal City. To the sculptor these were more than memories, for the great works of art were present there, fresh and glorious as when they came from their creators' hands. 'I was born,' he said, 'on March 8, 1797' (the day he entered Rome); 'up to that time I did not exist.' For long he worked away without exciting much attention, till a figure of 'Jason' was noticed by Canova, and T. found himself famous. Still, he had no money, and was forced to prepare for his return home, when Thomas Hope, the English banker, came to T.'s studio, saw the statue, and ordered it to be executed in marble for himself. This was the turning-point in his career. Wealth and distinction flowed in upon him without ceasing, and when he returned to Copenhagen in 1819, the whole town went out to meet him and do him honour. Next year he was again in Rome, and here he remained till 1837, when he finally settled in Copenhagen, where he died suddenly while in the theatre, 24th March 1844. He left his large fortune, and all the works which were in his own possession, to his native town. A splendid museum was built to contain them, and here also the remains of the artist were laid. During a long work-time T. executed about '200 bas-reliefs, 100 busts, 15 portrait-statues, about 60 statues from mythological and Christian subjects, and 10 monuments for tombs.' Of his works, the following deserve special notice. His statue of 'Mercury,' a remarkably expressive and still more suggestive figure. 'The Triumph of Alexander,' a bas-relief intended to adorn the palace of the Quirinal, and which is considered his greatest work. A great variety of figures, representing very various phases of feeling, are introduced, but the joy of the conquerors and the grief of the conquered, while serving to give expression to the most varied feelings, both tend to the one idea of the work—the triumph of the youthful hero. Of his equestrian statues, that of the emperor Alexander at Vienna is considered the best. His decorations of the Frue Kirche at Copenhagen are his best efforts in Christian art. It only remains to mention his figure of the 'Dying Lion' at Lucerne, 'hewn out of the living rock,' a memorial to the Swiss Guards who fell on 10th August 1792. The grand simplicity of the figure, and the situation where it is placed, produce an effect that no spectator ever forgets. For T.'s life and works, see Thiele and Hillerup's *T. og hans Vaerker* (Copen. 1831-50, and 1851-56); Anderson's *Bert. T.* (Copen. 1845); an English *Life of T.*, by Barnard (Lond. 1865), chiefly an abridgment of Thiele; and *T., his Life and Works*, by Plon, translated by E. Hoey (Lond. 1874).

Thoth. See HERMES TRISMEGISTUS.

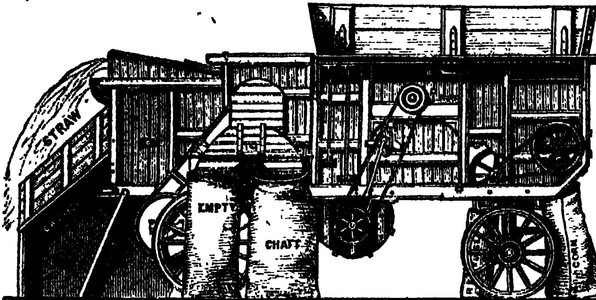
Thou (Lat. *Thuanus*), **Jacques Auguste de,** son of a first president of the Parliament of Paris, was born in that city, 8th October 1553. Educated at the Collége de Bourgogne, he studied law at Orleans, Bourges, and Valence; then returning to Paris, took orders and received a prebend of Notre Dame. In 1573 he travelled in Italy, in 1578 was appointed ecclesiastical councillor to the Parliament, and in 1581 was a member of a commission established under Séguier in Guienne, where T. held several interviews with Henri de Navarre, and was brought across Montaigne. Yielding to the pressure of his family, he renounced his orders, and having as a councillor of state (1588) aided the reconciliation between Henri III. and Henri de Navarre, he saw five years' campaigning with the latter. In 1593 he was appointed keeper of the royal library, and as a magistrate he zealously promoted the Edict of Nantes. On Henri IV.'s death T. aspired at the office of first president, and being merely summoned to the council of finance retired in chagrin from public life, and died 7th May 1617. T. was the author of an *Historia sui Temporis* (5 vols. 1604-20; best ed. Lond. 1733; Fr. trans. 1734 and 1759), which, covering in 138 books the period 1546-1607, is a laborious and truthful narrative, so strictly impartial that the papal censure placed it upon the *Index Expurgatorius*. His other works include *Thuani Commentarius de Vita sua* (1620; Fr. trans. 1711) and some excellent Latin poems. See the *Discours sur la Vie et les Ouvrages de T.* by Patin (1824), and Charles (1824); and Düntzer, *De T.'s Leben, Schriften, und historische Kunst* (Darms. 1837).

Thourhout' ('Thor's wood'), a town of Belgium, province of W. Flanders, 14 miles S.W. of Bruges by rail. It manufactures mustard, starch, sabots, hats, &c., and has a teacher's training-school. Pop. (1873) 7857.

Thrace (Gr. *Thraike*, probably from *tracheia*, 'rough') is a geographical term at first applied loosely to the whole of the mountainous region N. of Greece, but latterly confined to the district between the Danube on the N., the Euxine and Bosphorus on the E., the Propontis, Hellespont, Ægean, and the northern part of Macedonia on the S., and the Strymon and Illyria on the W. In the time of Philip II., and his son Alexander the Great, the boundary of Macedonia was advanced to the river Nestus, which henceforth marked the western limit of T., and by Augustus its northern boundary was withdrawn to the Hæmus (mod. Balkans), the region between which and the Danube being formed into the separate province of Mœsia. From the Hæmus three ranges extended southwards, of which that furthest to the W. was named Pangæus, and that to the E. Rhodope; to the centre ridge no name is given. The Pangæus separated the valleys of the Strymon and Nestus; to the E. of Rhodope was the Hebrus. The soil of the more level portions was fertile, and notwithstanding the alleged severity of the climate, the vine was largely cultivated. Cattle were extensively reared, and horses, a white breed of which was famous. Gold and precious stones were found in some parts, the existence of which to this day is confirmed by the French traveller Viquesnel. Of history T. has almost none; it was nominally subdued by all the great nations who came in contact with it, Persians, Macedonians, and Romans, but only the last effected anything like a real conquest of it, while the versatile Greeks secured to themselves the best products of the country by means of their flourishing colonies of Amphipolis, Byzantium, Salmydessus, &c. Under the Turks the greater part of it was included in Rumelia (q. v.).

Thrash'ing, an operation which consists in separating ripened grain from the straw on which it grows. From the earliest times in eastern countries T. was effected by the treading of oxen and horses on the straw and grain spread out over a floor of hardened clay, whence the Scriptural injunction, 'Thou shalt not muzzle the ox when he treadeth out the corn' (Deut. xxv. 4). This primitive method of T. is still prosecuted in many warm countries, such as Spain, Italy, Turkey, &c., a twofold object being attained by this rude and uncleanly process, viz., the separation of the grain, and the bruising and softening of the straw, whereby it is rendered fit for cattle fodder. In colder regions, where the straw is not so hard, and where hay is cultivated for fodder, the flail was long the simple and sole T. implement, and in primitive localities in Scotland, &c., it may yet be seen in operation. The flail consists of two stout sticks, the hand-staff, and the swingle, loosely attached to each other by a very strong, tough, flexible band of eel-skin or gut. The workman holding the hand-shaft in both hands swings the implement over his head, bringing the swingle down horizontally on the sheaf-head, which is opened out on the barn floor. The process is very tedious, and altogether unsuited to the modern requirements of even a small farm. No means of superseding it, however, were effectively devised till about the year 1785, when Andrew Meikle, a millwright in Haddingtonshire, Scotland, invented the T. mill, which, with unimportant

modifications, is the mill now in common use. The principle of Meikle's T.-mill consists in the use of a *drum* with beaters, which in its rapid revolution strikes against the corn fed into it with great violence, and thereby detaches the grain. The modern Scottish T.-mill, which usually forms a part of every farmsteading, based on Meikle's principle, consists of the following essential parts:—(1) The feeding rollers, a pair of grooved rollers working into each other, through which the corn is entered to the drum lying immediately behind them. By these rollers the straw is partly held while it is subjected to the beating of the rapidly rotating drum. (2) The drum, a cylindrical framework on which four or more beaters, consisting of projecting iron-shod bars, are mounted. The drum is enclosed in a case and is rotated



Thrashing Machine.

at a high speed, the beaters moving, on an average, 3500 feet per minute. In this the grain is detached from the ear, and the whole passes on to (3) the shakers, where the mixed grain and straw are separated. The shakers consist of two cylinders like the drum, with rake-teeth instead of beaters. They revolve slowly, the first passing on the straw to the second, while grain, chaff, and broken straw fall through the grating under these parts of the apparatus. The clean straw is tossed out of the apparatus by the second shaker, and slides down a grid-formed incline of wooden bars. Under the shakers is (4) the hopper, which collects the grain, chaff, &c., and passes them on to (5) the mill fanners, in which a fan blast separates the grain from the chaff. A second dressing is usually given to the grain in (6) the second fanners. The T.-mill is worked either by horse, water, or steam power, according to circumstances.

The English portable steam T.-machine is much more widely used than modifications of Meikle's apparatus, and even in Scotland it is now much employed. The drum used in these machines differs in its action from that in the Scotch mill, acting by rubbing the grain against a grating fitted around it rather than by beating it when held by feeding rollers. There are, indeed, no feeding rollers in the machine, the corn being fed direct to the drum, which carries it forward and rubs out the grain. The straw is thrown on a series of reciprocating straw shakers, by which it is gradually carried forward, while grain, chaff, &c., are separated and are carried to the riddle board. The English T.-machine is capable of T. at a rapid rate, and performs its work in a most satisfactory manner. It requires, however, to be made in a very solid and workmanlike fashion; and several agricultural implement-makers have attained a high reputation for their machines. With a portable engine the machine can be moved from field to field, T. the grain where it grew, which is often a great convenience; and it, moreover, can be transported to the various farms in a wide district, performing in a few days all the T. work required for a whole season. Thus one machine may do efficiently and economically the work of T. for many farmers, and a stationary T.-mill, which at most is only required at infrequent intervals, is rendered unnecessary in a part of a farm furnishing.

Thrasybu'lus, a celebrated Athenian general and democratic leader in the latter part of the Peloponnesian War, first heard of (411 B.C.) as commanding a galley in the fleet at Samos, afterwards one of the most active in bringing about the downfall of the Four Hundred and the recall of Alcibiades. His close friendship with the latter involved him in his disgrace after the battle of Notium, and on the establishment of the Thirty Tyrants he was banished, and retired to Thebes. In 403 he entered Attica at the head of seventy other exiles, seized Pyle, and occupied the Peiræus, and ultimately forced from the oligarchical party a general amnesty. In 394 he commanded the Athenian armies in Bœotia and before Corinth, and in 390 was sent with forty ships to aid the Rhodians against Teleutias. He next sailed to Byzantium and reduced several of the islands, but while cruising on the Pamphylian coast he cast anchor in the mouth of the Eurymedon, and was murdered in his tent by the natives during the night (390).

Thread, a fine cord or twine used for sewing. The greater part of the sewing T. used is made from cotton yarn in twisting-mills, but much strong T. is also made of linen. The use of T. has enormously increased of late years, owing to the introduction of sewing-machines. Paisley, near Glasgow, is the great centre of the T. manufacture, in the enormous factories of which it is believed that more than half of the T. made in the United Kingdom is produced. Several of the Paisley T. manufacturers also own great establishments in the United States, and it is scarcely too much to affirm that nearly one-half of the T. trade of the world is in the hands of Paisley manufacturers.

Thread-Cells, the name given to certain peculiar cells or cysts, found chiefly in the tissues of *Cœlenterate* (q.v.) animals. They contain fluid, and are provided with an internal thread-like filament. Under pressure the cell ruptures, the thread is everted, and the fluid escapes. These cells form a poison-apparatus for paralysing prey.

Thread-Worms, the popular name of certain *Scolecida* (q. v.) belonging to the order *Nematoda*. The best-known genus is the *Oxyuris vermicularis*, or small T. W., which inhabits the rectum or lower bowel of children especially. Nearly allied to this is the larger *Ascaris lumbricordes*, or common round worm, found in the human intestines, in that of the pig, &c., and attaining a length of 6 inches. The average length of the Oxyuris is about ¼th of an inch.

Threat, in a legal sense, is the endeavour to make any one surrender a right or possession by means of intimidation. The endeavour to compel surrender of personal property by T. of personal violence is Robbery (q. v.). Regarding T. of accusation see EXTORTION. See also FORCE and FEAR.

Three Kings, Feast of the. See EPIPHANY.

Thrift, or **Sea Pink** (*Armeria*), a genus of perennial herbs belonging to *Plumbaginaceæ* (q. v.), differing chiefly from *Statice* (q. v.) in the flowers being collected into bracteated heads at the apex of the scape. All the leaves are radical and very narrow, the flowers arranged in cymes which are massed into a dense hemispheric head, calyx funnel-shaped and scarious, petals cohering at the very base. There are about thirty species occurring in Arctic, alpine, and maritime N. temperate regions, and exceptionally represented in Chili in the S. hemisphere. The common T. (*A. vulgaris*), a plant of the three northern continents and Chili, is very common around the British coast, appearing also on high mountains up to 3800 feet in Scotland. It has a strong, woody, branched rootstock, dense cushions of leaves in compact tufts, from which arise scapes of 3 to 12 inches, bearing heads of rose-pink or white flowers. The plant is commonly seen in small gardens, forming an edging to the flower-beds.

Thrips, a genus of *Hemipterous* insects, of which *T. cerealium* infests and injures wheat to a large extent. In the family *Thripidæ*, of which T. is a typical genus, the wings are abortive, the mandibles bristle-like, and the antennæ long and slender. In *T. cerealium* the females have a four-valved ovipositor or boring apparatus, for the deposition of eggs. The front wings are thick, and the antennæ are nine-jointed. The male is wingless. These insects infest the spathes or sheaths of grasses and cereals, and destroy the stem by puncturing it and causing effusion of the nutrient fluids.

Throat, Diseases of the. The D. of the T. met with in the practice of medicine do not differ materially from the diseases of other parts of the body. The most frequent form of sore throat is that of a simple erythematous inflammation. The mucous membrane of the pharynx, palate, and tonsils is congested and swollen, and the sub-mucous connective tissue may be greatly relaxed. There is usually more or less heat and dryness of the parts, difficulty in swallowing owing to the pain excited by the movement, and almost always some degree of fever, with

more or less acceleration of the pulse. The treatment of this form of sore throat is very simple. The patient should be confined to bed in order to secure rest and an equable temperature, which is of great importance. A gentle but efficient laxative should be given, and if the pain is severe and the pulse accelerated, a small quantity of morphia and aconite may be added to the aperient. The diet should be light and easily digestible, and the free use of demulcent drinks may be encouraged. The inhalation of steam will be of service in the acute stage, and if the membrane be very much relaxed, astringent solutions of alum, nitrate of silver, carbolic acid, or chlorate of potass, may be topically applied in the form of spray. In *phlegmonous sore throat* there is a higher grade of inflammatory action, the sub-mucous connective tissue being affected, and the tonsils are usually affected in a greater degree than the surrounding structures, the disease being designated *amygdalitis*, *quinsy*, or *tonsillitis*. *Ulcerated sore throat* is often described under the name of *angina maligna*, or *tonsillitis maligna*, and is usually attended with typhoid symptoms. It is occasionally attendant upon diphtheria, and sometimes follows scarlatina, measles, smallpox, dysentery, and enteric fever; more or less fever of a low type being always present. The pain is not so severe as in ordinary sore throat, but soon after the commencement of the affection the tonsils and the surrounding structures are seen to be studded with dark ash-coloured ulcers, which soon slough, and give forth a fœtid, ichorous, or sanious discharge. The disease is apt to extend to the upper part of the pharynx and to the nasal passages, but the larynx is seldom involved. In severe cases death may occur from syncope, coma, or from gradual exhaustion of the vital forces. *Membranous sore throat* is characterised by the exudation of a fibrinous material, which coagulates into a false membrane. This form of *sore throat* is often met with during the prevalence of Diphtheria (q. v.), and is by many physicians considered a mild form of that disease. Clergyman's *sore throat*, or chronic *follicular pharyngitis*, has been already described under Disease of the Pharynx (q. v.).

Thrombo'sis (Gr. *thrombos*, 'a clot of blood') is the term used to designate an affection of the blood-vessels which consists in a coagulation of blood, forming a true clot, at a certain fixed spot. A clot thus formed in a vessel increases and extends from one to another till it reaches and finally fills a large vessel.

Throndhjem (Ger. *Drontheim*), the third city of Norway, occupies the triangular peninsula of Nidarnæs, between the mouth of the Nidelve and the Thondhjemsfjord, 243 miles N. of Christiania. T. is regularly built of wood, and has broad streets. It is defended by the old fortress of Thunkholmen. Its chief building is the Cathedral of St. Olaf (1093-1300), where the kings of Norway are crowned. There are three other churches. T. is a bishop's see, has a grammar school and real school, a deaf and dumb institute, a theatre, the Royal Norwegian Scientific Society, with a large library, and the head office of the Bank of Norway. T. exports timber, oil, copper, dried fish, and herrings. In 1877 there entered and cleared 88 British ships of 21,102 tons. Shipbuilding, iron-founding, distilling, and the manufacture of leather and tobacco and machines, are carried on. T. was founded in 997 by Olaf Trygvesön under the name of Nidaros, and in the 12th and 13th centuries was the usual residence of the Norwegian kings. It suffered much from fires in 1532, 1841, 1842, and 1844. Pop. (1875) 22,000.

Throne (Gr. *thronos*, from *thraō*, 'I set'), the chair used on occasions of state by a king, emperor, or pope. It is usually raised, and often surmounted with a canopy. The term is also applied to the seat of a bishop in his cathedral church, and is a common metaphor to express sovereign power.

Throw, a mining term used very generally among geologists, signifies the amount of vertical displacement produced by a Fault (q. v.).

Thrush, the name given very generally to a large number of species of Insessorial birds included in the family *Turdidæ*, which in turn forms a sub-group of the *Dentirostres*. A special sub-family (*Turdinæ*) includes the more typical species known as T. The bill is stout and compressed, the upper mandible notched at its tip, and the 'gape' furnished with bristles. The third and fourth quills are the longest, and the toes are long and strong. Of the T. one of the best known is the Missel T. (*Turdus viscivorus*), which measures 10 or 11 inches, and is of a dull brown on the upper parts, and yellowish-white below, both surfaces being marked with black spots. The Missel T. begins its song, which is loud and clear, as early as February, and breeds in April. The Song T. (*T. musicus*) has a clear, sweet voice, and is popularly named the 'Throstle' from its singing powers, or in Scotland the 'Mavis.' The colour is brown marked with black above, and whitish yellow beneath. The length is 8 or 9 inches. The eggs usually number five, and are of a bluish tint, spotted with black. The bird may be successfully kept in captivity. The nest is usually built in the middle of a thick shrub, and the male takes part in incubation. The mavis remains throughout the year in Britain, and feeds on worms, snails, berries, seeds, &c. The Wood T. (*T. mustelinus*) is a N. American species, which migrates from N. to S. in winter. It is smaller than the others. In the W. Indies the T. is represented by the *T. leucogenys*, or 'Hopping Dick,' a bold and lively species of T., with a clear and brilliant song.

Thrush, Infantile Sore-Mouth, or **Diphtheria of the Mouth,** is essentially a disease of early infancy. It is very frequently met with in connection with the artificial feeding of young children, and is evidently connected with impaired nutrition. It may also be the result of inflammation of the mucous membrane of the mouth, or it may depend on the development of cryptogamic vegetation on the mucous membrane. The symptoms are numerous small white spots on the mucous membrane of the mouth, the inner surface of the lips, and especially near the angles of the mouth, the inside of the cheeks, the tongue, and sometimes on the gums. The spots are generally of a circular form, about the size of a pin's head, and are firmly adherent. Sometimes the spots coalesce, and the mouth may be extensively coated with a false membrane, a condition sometimes called Aphtha (q. v.).

Thrush, in veterinary surgery, is an affection of the horse's 'frog,' appearing as a severe and acute inflammation, which usually proceeds to ulceration, and which is accompanied by a fœtid discharge. It is most frequently seen in horses of unsound constitution, and especially appears in stables where the drainage is deficient, and uncleanliness prevails. The best application for T. is *mineral tar*. Calomel-dressing is to be substituted for the tar in severe and intractable cases, and ulcerated and loose parts of the frog are to be carefully removed.

Thucyd'ides, the greatest of the Greek historians, was born at or near Athens, about 471 B.C. He belonged to a noble and wealthy family of Thracian origin. From his own pages we gather that he had some hereditary property in gold mines at Scapti-Hyle in Thrace, and that he saw service as a divisional commander in the war of which he became the historian. He is said to have been instructed by Antiphon in oratory, and by Anaxagoras in philosophy. He was one of the few sufferers who recovered from the plague at Athens in 430 B.C. In 424 he held a naval command in the Peloponnesian War, but the expedition under his charge was unsuccessful, and he was forced to go into exile for twenty years (423-403). This long interval he passed in travelling, collecting materials for and writing his history. Soon after his return, about 401, he met his death, probably by assassination, either at Athens or at Scapti-Hyle. T. wrote one great work, *The History of the Peloponnesian War*. It is divided, though not by the author himself, into eight books. There are doubts as to the genuineness of the last of these. In the first book, after a rapid review of the previous history of Greece (chaps. 1-21), he sets forth the alleged causes of the war, and narrates the preliminary negotiations, with digressions on the rise of Athens, the treason of Pausanias, and the exile of Themistocles. The remaining seven books are occupied with the annals of the war. Their form is that of a yearly chronicle of events, and each year is divided into two parts, summer and winter. The history terminates six years before the final conclusion of peace. The merits of T. as a historian are very high. He was an acute and experienced observer, and an accurate and unprejudiced reporter. His work is written in accordance with the principles of ancient literary art. He does not turn aside to notice any collateral subject, but relates with plain directness the events that directly concern his purpose. His style has the severe simplicity of an antique statue. His account of the plague at Athens, and of the disastrous expedition against Syracuse,

are justly regarded as masterpieces of historic description. The speeches with which he has interspersed his relation form in many respects a striking contrast to the rest of the work. 'They do not arise from the narrative, but are fitted into it.' They are reviews of the situation, maxims of polity, encouragements and exhortations put into the mouths of the leaders of the opposing parties. To a great extent they must have been the work of the historian himself. They are often involved in construction and difficult to follow, the thought seems too weighty for the words that attempt to express it, yet they contain many passages of the very highest merit. The noble oration which Pericles is represented as delivering over the ashes of the Athenian soldiers, is surpassed by no passage in the greatest of the Attic orators. The best editions of T. are by Bekker (3 vols. Berl. 1821), Poppo (10 vols. Leip. 1821-38), Arnold (3 vols. Oxf. 1830-35); the best translations—French, by Zerost and M. Betant (Par. 1853 and 1863), English by Hobbes (Lond. 1628), and Bloomfield (1829), German by Klein (Munich 1826). For a popular account see also the volume by the Rev. W. Lucas Collins in Blackwood's *Ancient Classics for English Readers* (1878).

Thug (*thag*, a Sanskrit word for 'cheat,' 'knave'), a term specially applied to a peculiar class of robbers and assassins, who rendered all the roads in Central and Northern India unsafe up to the beginning of this century. They sallied forth in small gangs, and having gained the confidence of fellow-travellers, took a favourable opportunity of strangling them by a peculiar twist of their turbans or kerchiefs. They had a special thieves' language of their own. The more correct appellation is *phansi-kar*, 'stranglers,' from *phansa* = 'a noose.' They are said to have sprung up under the Mogul dynasty; Akbar executed 500 at Etawah. In the same neighbourhood, in 1810, 30 dead bodies of their victims were taken out of the wells in one year. In 1830 a special department for the suppression of Thugism was organised by the British Government under Lord H. Bentinck, and put under the charge of Colonel Sleeman. The energetic measures adopted were thoroughly successful, and it is believed that this class of murderers is now extinct, though they have left successors in secret poisoners. See Colonel Meadows Taylor's *Confessions of a T.* (Lond. 1840).

Thuja. See ARBOR VITÆ.

Thu'le, the name given in classical writings to an island of the Atlantic—the farthest N. portion of the land-surface of the globe. Pliny (ii. 77) tells how Pytheas, a Greek navigator of Alexander the Great's time, discovered it by a six days' voyage N. from Orkney. Hence it is usually identified with Iceland, or some part of Scandinavia. Ptolemy, however, identified it with the *Mainland* of Shetland, and is supported in modern times by Kiepert. Tacitus (Agri 10) describes it as having been sighted by a fleet which subdued Orkney, so that he probably meant Shetland. In later Roman times *ultima T.* came to be a more or less indefinite term for the 'far North' The probable root of the word occurs both in the Teutonic and classical languages, as the Gothic Tiel and the Greek *telos* ('end').

Thumb'ikins or **Thumb'screw**, an instrument of torture for violently compressing the thumbs, employed by the Inquisition (q. v.), and also much used in Scotland during the 17th c. It consists essentially of two metal bars, which are made to approach each other by means of a screw.

Thun, a picturesque Swiss town in the canton of Bern, beautifully situated on the Aar, ¾ miles below its efflux from the Lake of T., 18 miles from Interlaken, and 32 miles S.S.E. of Bern by rail. Its principal street is curious—in front of the houses projects a row of magazines and cellars 10 feet in height, the flat roofs of which afford a pavement for foot passengers flanked with the shops. From the bridge a covered way of 218 steps leads to the church, erected in 1738; near the churchyard is the square tower of the old castle of Zähringen-Kyburg, within which is the Amts-Schloss, or residence of the bailiffs, erected in 1429. T. contains the military school of the Swiss confederation, and is the chief seat of the trade of the Oberland. Pop. (1870) 4623.—The **Lake of T.** extends S.E. for 10½ miles with a breadth of 2 miles, and is 1837 feet above the sea-level. Its greatest depth is 1844 feet. Its banks in the S. are fringed with picturesque villas and gardens; in the northern part by bold, rocky cliffs. To the S. stand the Niesen (7765 feet in height) and the Stockhorn (7195 feet high). See *Thun und Thuner See* (Zür. 1878).

Thun'der. See LIGHTNING.

Thur (*thar*), the great Indian desert which intervenes between the left bank of the river Indus and the hills of Rajputana, has a total area of about 68,700 sq. miles. It consists of a succession of sandy ridges, in appearance like the waves of a sea, running N.E. and S.W., and highest towards the E. It is thought that much of this tract was once fertilised by the Indus or its branches. No rain falls on the T., and it is now almost uninhabited. The *district* of T. and Parkur, province of Scinde, Bombay Presidency, has an area of 12,729 sq. miles, and a pop. (1872) of 180,761. The only town is Umarkote (q. v.).

Thur'gau (Fr. *Thurgovie*), a Swiss canton, stretching in the W. and E. along the Lake of Constance and the Rhine, comprises the fertile valley of the Thur, and the smaller vales which diverge from it. Area, 379 sq. miles; pop. (1877) 95,390, of whom 69,231 are Protestants, and 23,454 Roman Catholics. T. is only mountainous in the S., where rises the Hörnli, 3605 feet high. One of the richest of the Swiss cantons, it has 35,082 hectolitres under corn, and 22,000 in meadow, and produces much fruit and wine. The number of cattle (1874) was 34,719, of horses 3157, of sheep 2697, of goats 6571, of swine 6660, of bee-hives 7091. There are important fisheries in Lake Constance and the Rhine, yielding 150,000 trout annually. Frauenfeld is the capital, and the chief industrial establishments are cotton-mills, and dye and print works. The Rhine valley railway is continued along Lake Constance, and is joined at Romanshorn by the line from Zürich, which traverses T. from E. to W., crossing the Limmat by an iron bridge, and passing under the Käferberg by a tunnel 1020 yards long. See Häberlin, *Der Kanton T.* (Frauenfeld 1877).

Thur'ifer. See INCENSE.

Thurin'gia (Ger. *Thuringen*), the name given to that part of Central Germany lying between the Thuringer-Wald and the Harz Mountains, and including parts of the Prussian province of Saxony and the Saxon duchies. It is derived from the Thuringii, who were in possession of the country in the 5th c., and who were probably descended from the Hermunduri. The name has only a lax geographical meaning.—**Thuringer-Wald**, a mountain-range, extends along the right bank of the Werra from the influx of the Horsel for about 60 miles, and then joins the Frankener-Wald in N. Bavaria. It is covered with pine forests, and consists mainly of granite, porphyry, and slate, containing rich veins of iron ore. The highest points are Schneekopf (3400 feet), Gross-Beerberg (3435), Inselberg (3223), and Finsterberg (3209).

Thurles, a market town of Tipperary, Ireland, on the Suir, 86¼ miles S.W. of Dublin by rail, contains a fine Catholic cathedral, some religious houses, and St. Patrick's College (1836). Chiefly agricultural, it has some manufactures of shoes, wool, and shirts. Pop. (1871) 5008, of whom 1873 were Catholics. At T., in the 10th c., the Irish defeated the Danes.

Thur'low, Edward, Lord, second son of the Rev. Thomas T., was born in 1735 at Little Ashfield, Suffolk, educated at Caius College, Cambridge, and called to the bar in 1758. His imposing manner and sonorous voice made a favourable impression, and his appearance as junior counsel in the great Douglas case established his reputation. In 1771 he became Solicitor-General, and zealously supported the policy of the Government towards its American colonies. In 1778 he was raised to the woolsack, but was soon discovered to be an impracticable and troublesome member of the administration. When Pitt became Premier in 1783, T. ostensibly supported him for a time, but at last his enmity could no longer conceal itself, and he began to openly oppose the measures of the ministry. In 1792 Pitt demanded and obtained his removal from office. His public career thus suddenly came to an end, and the remainder of his life was spent in obscurity. He died at Brighton, September 12. 1806. 'No man,' said Fox, 'was ever so wise as Lord T. looked.' T.'s personal habits were far from irreproachable; and on the memorable occasion when he wound up a defence of the king with 'When I forget my sovereign, may my God forget me!' Wilkes is reported to have replied, 'Forget you! He'll see you d——d first!' Nothing that is known of this celebrated lawyer justifies the distinction to which he attained. See Campbell's *Lives of the Lord Chancellors, &c.* (8 vols. 1846-47).

Thur'mayr. See AVENTINUS.

Thurs'day (Scan. *Thorsdag*; Ger. *Donnerstag*), the fifth day of the week, named after the god Thor (q. v.). Among the Romans the same day was dedicated to Jupiter, and called *Dies Jovis* (Fr. *Jeudi*).

Thur'so ('Thor's town'), the most northerly town of Scotland, in Caithness, 21 miles N.W. of Wick. It is the terminus of a branch line of the Sutherland and Caithness railway, and is magnificently situated on a spacious bay of its own name (also called Scrabster Roads), which affords excellent anchorage, and is confined on either side by the bold rocky masses of Holborn Head and Dunnet Head, rising to a height of 300 feet. Between the two promontories T. looks out over the wild Pentland Firth to the grand cliff scenery of Hoy and others of the more southerly Orkneys. The River T., which is 25 miles long, and is here crossed by a stone bridge, affords good salmon-fishing. The harbour is obstructed by a bar, but has a good pier and custom-house. T. is an important fishing centre, exports fish, Caithness flagstone, cattle, sheep, &c., and has some linen, woollen, leather, and straw-plait industries. A little to the E. stands T. Castle, the seat of Sir G. Sinclair, Bart., and further along the shore Harold's Cross, erected to the memory of Harold, Earl of Caithness, who fell here in 1190. Pop. (1871) 3604. T. was the home of Robert Dick, the Caithness geologist, and the subject of Smiles' charming memoir, published in 1878.

Thwarts are the transverse planks of a boat which keep the sides apart, and on which the rowers sit.

Thy'lacine (*Thylacinus cynocephalus*), a species of rapacious or carnivorous *Marsupialia* (q. v.) inhabiting Tasmania, where it is named the 'native hyæna' by the colonists. The head is large and prominent, and the back is transversely striped with bands of dark hue. T. attains the size of a large dog, and as it is destructive to sheep and other animals, a constant war of extermination is carried on against it.

Thylaco'leo, a remarkable genus of extinct *Marsupialia* (q. v.), the fossil remains of which occur in the Recent or Tertiary and Post-Tertiary deposits of Australia and Tasmania. Professor Flowers regards T. as a 'highly-modified and aberrant form of the type of marsupials now represented by the *Macropodidæ* (Kangaroos) and *Phalangistidæ* (Phalangers, q. v.), though not belonging to either of these families as now restricted.' A characteristic of T. is the presence in each jaw of one large, compressed, and sharp-edged premolar tooth. The canines are small.

Thyme (Gr. *Thymus*), a genus of *Labiatæ*, comprising about 40 species of much-branched, very aromatic small shrubs, with small entire leaves and whorled flowers arranged in spikes. The plants are often hoary. The species are natives of temperate regions of the Old World, particularly of the Mediterranean region. Garden T. (T. *vulgaris*), of which the young leaves and tops are used either green or dried in soups, stuffings, stews, or sauces, is a S. Europe plant. The oil of Origanum of commerce is obtained from it. The familiar wild T. of dry banks, pastures, and hill-sides grows from Greenland eastward to the Himalaya. A variety, called Lemon T. (T. *citridorus* of Persoon), is grown in gardens for its grateful scent and for seasoning.

Thymelea'ceæ, a natural order of gamopetalous dicotyledonous shrubs, small trees, or wiry herbs, with tenacious inner-bark and acrid juice. T. contains 40 genera and about 300 species, dispersed through temperate and tropical regions, predominating in S. Africa, and many occurring in Australia. The best-known genus is *Daphne* (q. v.). In N. America the tough branches of *Dirca palustris* or 'Leather-wood' are used for cordage and basket-making. Under this order is generally classed *Aquilaria agallocha*, which yields a great portion of the famous aloes-wood or eagle-wood used in incense, and to make ornaments and rosary beads. *Pimelia*, an extensive Australian and New Zealand genus, extremely variable in foliage, includes several species grown as ornamental greenhouse plants, and some of the species supply a cloth and string from their bark. The fruit of *P. arenaria* is eaten. *Struthiola*, a large genus of pretty plants with white flowers deliciously scented in the evening, and *Gnidia*, with yellow, pink, blue, or white flowers, and some large and handsome *Passerina*, are greenhouse plants in Europe introduced from Africa. See LACE-BARK TREE.

Thy'mus Gland, a structure occurring in the neck, and usually considered one of the so-called *ductless glands*, of which the Spleen (q. v.) is the best-known example. The T. G. is at best a temporary organ in human existence. It attains the maximum of its growth about the end of the second year of life, and thereafter dwindles, until at the period of Puberty (q. v.) it has well-nigh disappeared. It consists at its period of full development of two lobes, united in the median line, and situated partly in the neck and partly in the space known as the *mediastinum*. The T. G. is covered by the breastbone and by the origins of the *sterno-hyoid* and *sterno-thyroid* muscles. Its colour is a pinkish-grey, and its consistence is soft. Externally it presents a lobulated appearance. Its length is about 2 inches, and its thickness three or four lines. Its weight at birth is about half an ounce. Each lobe of the T. G. is composed of *lobules*, united by delicate areolar tissue, the lobules varying in size from a pin's head to a small pea. In the centre of each lobule is a small cavity, and these cavities open into the larger cavity of the lobe, named the *reservoir of the thymus*. The latter cavity has a vascular lining membrane, and usually contains a milky fluid resembling *chyle*. This fluid contains corpuscles, undistinguishable from chyle-corpuscles, and attaining a diameter of the one-thousandth part of an inch. The T. G. derives its blood from the internal mammary and superior and inferior thyroid arteries, whilst its nerves are obtained from the pneumo-gastric and sympathetic trunks. Chemically examined, the T. G. is found to consist of albumen and fibrine, along with gelatine, and alkaline and earthy phosphates, with chloride of potassium. Water to the extent of 80 per cent. enters into the composition of this gland, whose functions are as yet undetermined.

Thyroid' Gland, one of the *ductless glands*, and therefore in the same category as the spleen, thymus gland, and supra-renal capsules. The T. G. lies at the upper part of the *trachea* or windpipe. It consists of two lobes or halves, placed one on each side of the windpipe, and united by a narrow connecting band, the *isthmus of the thyroid*. Its colour is a brownish red, and its weight varies, the maximum being about 2 ounces. In females it is larger than in males, and is said to increase in size during menstruation. When enlarged, the T. G. gives rise to the disease known as *Goitre* or *Bronchocele*. Each lobe of this gland attains a length of two inches, and three-fourths of an inch in breadth. Occasionally a third lobe, called the *pyramid*, is found to arise from the upper part of the isthmus on the left side, or from the left lobe of the gland itself. In minute structure the T. G. consists of small closed sacs or vesicles surrounded by a dense network of blood-vessels. The vesicles contain a yellowish fluid, in which numerous *corpuscles* or nucleated cells are found. The arteries of the T. G. are named the *superior and inferior thyroid*. They are large and unite frequently in the course of their distribution. The nerves of the T. G. are obtained from the *pneumogastric trunks*, and also from the *sympathetic system*. The functions of this gland, like those of the Thymus Gland (q. v.), are still unknown.

Thyr'sus, in botany, is the name for an Inflorescence (q. v.) where *cymes* of flowers are arranged in a narrow pyramidal panicle; or where a much-branched panicle is pyramidal in shape. Common examples are the lilac and the horse-chestnut.

Thysanu'ra, according to Latreille, an order of lower insects distinguished by the want of metamorphosis, the absence of wings, and the sharpness of its bite. Most authorities now regard the T. as a form transitional in nature between *Insects* and *Myriapoda*. The best-known genus are the *Lepismatidæ*, including the sugar-mites and bristle-tails, and the *Poduridæ* or spring-tails. The possession of terminal bristles, by the sudden recoil of which these insects leap, is the most marked characteristic.

Tia'ra is the name of the Pope's triple crown, which is the symbol of his temporal power as the keys are of his spiritual jurisdiction. Originally a round cap, there was afterwards affixed to it a crown or border of crosses to indicate an acquisition of regal power. A second crown was added by Boniface VIII. in 1299, and a third by Urban V. in 1362.

Ti'ber (Lat. *Tiberis*), the most famous of Italian rivers, rises at the base of Mount Aquitone, a spur of the Apennines, province of Arezzo, at a height of 1600 feet above the sea. In its sinuous southerly course it passes Perugia, Todi, Orvieto, and Rome, and receives the Chiasca, Nera (*Nar*), and Teverone or Anieni (*Anio*) from the left, and from the right the Chiana and

Paglia. In the Campagna it swerves to the S.S.W., and enters the Mediterranean 27 miles below Rome by two branches, enclosing the Isola Sacra. Its length is 220 miles, its drainage area 6500 sq. miles. Of its two mouths, the more northerly, the Fiumicino, is the channel of a considerable import trade in wine, corn, charcoal, &c. But the T. is only navigable for vessels of 140 tons to Rome, at which point it is 300 feet broad, and from 12 to 18 deep. Its mean delivery is about 400 cubic yards per second, greater than that of the Thames and Severn put together; its smallest volume is 215 cubic yards. Rozet calculated that the sediment deposited at its outlet had varied little for centuries, and was enough to extend the coast at the rate of 13 feet yearly. It was possible under the Empire to land an obelisk of 400 tons brought from Egypt, at a point only 3 miles below Rome. But the estuary which formed the ancient harbour became silted to such an extent that it was found necessary to cut an emissary from a point considerably above Ostia, and this ship-canal is the modern Fiumicino. A project set on foot by Garibaldi to divert the T. into a new channel from above Rome, to save that city from inundations and improve the climate and the Campagna, has been abandoned, but there are still various schemes advanced for the canalisation or embankment of the river. Against the feasibility of these designs are urged the amount of rainfall and its periodicity, the concurrence of overflow in the tributary basins, the permeability of the soil, the shortness of the river's lower course, with its almost imperceptible slope from Rome of one inch to the mile, and the constant level of a tideless sea. The last great inundation was that of 1870, when the river rose 12·15 feet above the pavement of the Ripetta, and flooded the whole N.W. quarter of Rome, including the Corso. Such inundations, by checking the sewers, seriously interfere as a rule with the sanitary state of the city, but in this case no evil result followed. A railway from Rome to its port of Fiumicino was opened in February 1878. See *Studi sulla Geographia Naturale e Civile dell' Italia* (*Soc. Geo. Italiana*); W. Davies' *Pilgrimage of the T., from its Mouth to its Source* (Lond. 1873); and S. A. Smith's *T. and its Tributaries, their Natural History and Classical Associations* (Lond. 1877).

Tibe'rias (mod. *Taberije*), historically a very important town of Galilee (q. v.) on the S.W. shore of the Sea of Genesareth, which took from it the name of the Sea of T., was founded by Herod Agrippa in honour of the Emperor Tiberius (q. v.). For many centuries after the fall of the Roman Empire in Syria it was a seat of Jewish learning. After the First Crusade it was erected into a principality, but on the defeat of the Christians by Saladin in the neighbouring plains, July 4, 1187, was reduced to ruins. On New Year's Day, 1837, it was again destroyed by an earthquake, and has now barely 2000 inhabitants, of whom three-fourths are Jews.

Tibe'rius (Claudius Nero Cæsar), the second Roman emperor, was born November 16, 42 B.C. He was the son of Tiberius Claudius Nero and Livia Drusilla, who became the wife of Octavianus Cæsar in 38 B.C. T. and his brother Drusus were now brought up in the household of their stepfather, who from the year 27 B.C. was the Emperor Augustus. They were early initiated into public affairs, and in 16–15 B.C., at the head of a Roman army, subdued the Rhaeti and Vindelici. T. now returned to Rome to celebrate his first triumph, and in 13 B.C. was appointed consul together with P. Quintilius Varus. Meanwhile, Drusus carried on the war in Germany with great success, but died in 9 B.C., in consequence of a fall from his horse. T. hastened to Germany, and, after having carried his brother's body to Rome, returned and prosecuted the war with great vigour. In 7 B.C., having led his army across the Rhine into the country already half conquered by Drusus, he returned to Rome, becoming consul for the second time, and celebrating his triumph in the same year. In 12 B.C. he had been compelled by Augustus to divorce his wife Vipsania Agrippina, and become the third husband of his infamous daughter Julia; but, disgusted by her profligacy, and by Augustus having appointed as his successors Caius and Lucius Cæsar, her two sons by her second husband, Marcus Vipsanius Agrippa, he voluntarily retired to Rhodes in 6 B.C., where he passed seven years in seclusion. He returned to Rome 2 A.D., in which year Lucius Cæsar died at Massilia, on his way to Spain, while his brother Caius died a year and a half later in the East from a wound which he had received in the Parthian war. T. was accordingly adopted by Augustus as his successor in 4 A.D. In the same year he led an army into Germany, marched to the Elbe, and defeated the Sigambri, Bructeri, and Cherusci. The suppression of a revolt in Pannonia and Dalmatia procured for him the honour of a third triumph. He was now sent once more against the Germans, who, under their great chief Arminius, had cut off Quintilius Varus, with three legions. Accompanied by the young Germanicus, he crossed the Rhine, and during the years A.D. 11 and 12 traversed the countries E. of that river. On the death of Augustus, in 14, T. became emperor. He was in his fifty-fifth year, and, though beloved by none, he was much respected for the dignity of his demeanour and the reputed severity of his virtue. For some years he affected to take no active part in public affairs, while he gradually destroyed the last remnants of the ancient republic, abolishing the *Comitia*, and transferring the election of public officers to the subservient senate. Augustus had employed the *Lex Julia Majestatis* to punish the authors of libels against his person, and T., following his example, established the *Judicia Majestatis*, for the trial of persons suspected of having, in word or deed, impugned the majesty of the emperor. The number of *delatores*, or public denouncers, daily increased, while every citizen moved in an air of anxiety and suspicion. After the death of Germanicus in 19, not without suspicion of poisoning, T. strove less to conceal his hidden vices, while the servility of the senate, and the irritation of pasquinades and continual discoveries of plots, deepened the gloom of his suspicion. In his 67th year he retired to the island of Capreæ to enjoy seclusion, leaving to Ælius Sejanus (q. v.), commander of the Prætorian guards, the direction of public affairs. Blinded by the misrepresentations of Sejanus, he agreed to every measure which the latter felt to be conducive to his own ambition, and a long and uniform series of cruelties followed. Awakened at last to the ambitious schemes of his favourite, T. ordered the senate to condemn Sejanus, and the latter, with his family and friends, was put to death in 31. Some time after this, T. took up his residence at Misenum, where, as at Capreæ, he plunged himself into the most disgusting debauchery. On the 16th of March, A.D. 37, he fell into a lethargy, and being believed to be dead, Caligula was proclaimed emperor. T., however, recovered, but he was suffocated in his bed by Macro, to save himself and the young emperor. The elaborate picture of the emperor given in the first six books of the Annals of Tacitus, can hardly be considered a fair representation of his character. The historian, as an admirer of the old republic, had a strong bias which impelled him to take the worst view, and he has himself confessed that he drew his accounts from poisoned sources. The history of T., he tells us, 'was falsified, while he reigned, through terror, and written after his death with the irritation of a recent hatred.' That T. was a brave and skilful soldier and a careful financier cannot be doubted; while, however, unpopular at Rome, he was regarded by the provincials as a wise and beneficent ruler. Perhaps a taint of the insanity which was characteristic of the Claudian house, and a vein of superstition and fatalism, go far to explain many of the acts of 'atrocious villany and revolting depravity' which disgraced his later years. See Freytag, *T. und Tacitus* (Berl. 1870), T. Stahr, *T.* (2d ed. Berl. 1873), and E. S. Beesley's *Cataline, Clodius, and T.* (Lond. 1878).

Tibet' or **Thibet'** (native name *Bod* and *Bodyul*, Ind. *Bhot* and *Bhotiya*), the name applied by Europeans to the country of Central Asia, separated on the S. from India by the Himalaya, and bounded N. by Mongolia, E. by China proper, and W. by Turkestan, between 28–35½° N. lat., and 79–95° E. long. Area 999,220 sq. miles; pop. estimated at 4,000,000.

Physical Features.—T. is divided into four great provinces—Kam, in the E., bordering on Szechuen in China; Ari, the mountainous region W. of the Marjam-la Pass, including Ladak; U, and Tsang forming Great T., extending from the Mariam-la down the basin of the Brahmaputra. The lower part of T. consists of an elevated, undulating valley, with a N.W. to S.E. slope, and an average elevation of 15,000 feet, between the southern and central of the three great parallel chains of the Himalaya (q. v.). The most northern of the three is divided into two sections, the western or Karakorum Range separating the valley of the Indus from that of the Yarkand River and the other streams belonging to the inland system of Lob-Nor, and

the eastern, the Ninjinthangla or Nyenchhen-tang-la Mountains, extending E. and N.E. from the peak Kailas or Gangri (22,000 feet), forming the northern watershed of the Brahmaputra, and reaching in its highest point to 25,000 feet. The southern watershed of the Brahmaputra is the Central Chain, diverging from the Mariam-la Pass near the Gangri peak, which divides the Sutlej from the Brahmaputra, and extending parallel to the northern chain. On its southern slopes are the sources of the Kali, Karnali, Narayani, Arun, and Subanshiri, which force themselves through the southern chain of the Himalaya and reach the plains of India to join the Ganges or Brahmaputra, and it is crossed by the passes of Lagulung-la (16,000 feet), Taku-la, No-la (16,623 feet), and Photu-la (15,080 feet). The Southern Himalaya, which separates T. from Nepaul, Sikkim, and Bhutan, is a stupendous ridge throwing up the highest peaks on the surface of the globe, and is intersected by deep river gorges and narrow passes, of which the principal are, in Nepaul, Taklakhar and Kirong, the latter the highroad from Khatmandu to T., in Sikkim, Donkia, Kongra Lama, Dangola, and Jeylub, and in the Chumbi valley, Pari-jong, the pass by which Bogle and Manning entered T. Numerous freshwater lakes occur on the declivities between the chains, in the region of the Sutlej, Rakas-Tal, and Mansarowar (*Mapang*), (15,472 feet). In the E. part of the central range is Lake Palti, Peiti, or Yamdok-chu (13,590 feet). In Cashmerian T. are numerous salt lakes, of which the largest are Pang-Kong and Tsomoriri, near the English frontier (14,900 feet). From the northern region to the Kuen-Lun Mountains extends a region called by the natives Horsok, consisting of a broad series of elevated and still unexplored steppes, sparsely covered with grass, in which groups of parallel chains raise themselves upwards of 3000 feet. Numerous lakes occur, many of them salt, of which the chief are in the E., Namcho or Tengri-Nor (15,200 feet), and in the W., Ike Namur Nor and Bakha Namur Nor.

Climate, Productions, &c.—The mean annual temperature in T. at an altitude of 12,000 feet is 41-43° F., and the lowest 4° F. The remarkable aridity of the atmosphere modifies the extreme cold consequent on the great elevation. The snow-line, which is on the S. slope of the Himalaya 14,000 feet, is 16,000 on the northern declivities, and in the valleys of T. corn is sown at a height of even 16,500 feet, while roses grow up to 13,000 feet. Barley and leguminous plants are sown, and rye and wheat in the valley of the Brahmaputra up to a height of 12,000 feet; these crops, however, do not ripen until September. From the want of irrigation, agriculture is only possible in the valleys; in the higher grounds the pastures are frequented in summer by wandering tribes. There is an utter destitution of forest in T.; poplars and willows are the principal timber, and the only fuel is the dung of cattle. The principal domestic animals are the yak, a small kind of horse, goats with long coats of a fine wool known as *pashne*, sheep and dogs, of which great numbers are kept. The principal wild animals are the muskdeer, the kyang, the yak, a very large mountain sheep (*Ovis argali*), the Pseudovis nahoor, another sheep as large as a common deer, bears of a small kind, and a species of leopard (*Felis macroscelides*). T. has a large trade with Mongolia and China, and with Nepaul and Bhutan by the Himalaya passes. The merchants come in December and leave in March before the rivers are flooded. The chief articles of export are silver, gold, salt, borax, woollen stuffs, furs, drugs, musk, and wool; and the chief articles imported are, from China, silks, carpets, and hardware; from Mongolia, leather saddlery, sheep, and horses; from Bhutan and Sikkim, rice and tobacco; from Nepaul, silk, indigo, coral, sugar, spices, and Indian manufactures; and from Ladak and Cashmere, saffron and Indian commodities. Lassa and Shigatze are the centres of trade, and the principal marts outside of T. are Dewangiri and Udelgiri in Assam, Darjiling for the Chumbi valley trade, Patna for that passing through Nepaul, and Cashmere for the long route by the Mariam-la pass.

Inhabitants, Religion, &c.—The greater number of the inhabitants of T. are of Mongolian origin. On the northern steppes are two distinct nomadic races, the Hor of Turkish origin and the Sok of Mongolian, which, however, are both styled Kháchhén (Mohammedans) by the Tibetans. Caste divisions do not exist in T. Polygamy is common among the more wealthy, and among the people, polyandry, owing to the general poverty. The tone of morality is consequently low, while the people are sunk in ignorance and superstition. The religion is Buddhism (q. v.), though there still lingers in Kam an old religion called *Bon* or *Pon*, which seems to have been a worship of the powers of nature. The three principal incarnations are the Dalai Lama, the Buddhist pope, the Teshu Lama, and the Taranath Lama. Next to these are the abbots of monasteries, and under them the priests (see LAMAISM), who are all subjected to celibacy, and divided into several classes. On an average every thirteenth, in some places every seventh, man is a monk. Religious services are conducted with a gorgeous and imposing ritual. Characteristic of T. are the mechanical prayer-mills, found everywhere, and the prayer-flags, each inscribed with the mystic paternoster, *Om Mani padme hum* ('Ah, the jewel is in the lotus').

Language and Literature.—The language of T. is one of the monosyllabic speeches of Eastern Asia, and has preserved the same written form for upwards of 1200 years, while the style and the oral speech have undergone considerable change. In 632 A.D., the Indian Devanagari alphabet was introduced, and the work of translating from the Sanscrit the sacred Buddhist books begun by order of King Srongtsan Gampo. These, with a few original works, form two large collections,—the *Kanjoor*, of 100 vols. in seven divisions, and the *Tanjoor*, in 225 vols. The language has thirty consonants, no diphthongs. In writing, each syllable is separated by a point. Inflexion is supplied by connecting affixes or suffixes, but in the verbs, changes in the roots are frequent. The verb is impersonal, has no distinguishing forms for active and passive, and generally stands as the last word in the sentence. Grammars have been published by Schröter (Serampore 1826), Csoma (Calcutta 1834), J. F. Schmidt (St. Petersb. 1839-41), Foucaux (Par. 1858); the best, however, is the *Short Practical Grammar of the T. Language* (Kyelang in Lahol 1865), by H. A. Jäschke, who has also published a *Tibetan-English Dictionary, romanised* (*ib.* 1866), and a great *Stellenwörterbuch der Tibetsprache* (Gnadau 1871-75).

History.—The traditional history of T. begins in the first century before Christ. Two hundred years later a great part of the country was subdued by China. Buddhism was introduced by King Srongtsan Gampo, who made Lhasa his capital. In 1640, after many struggles, the crozier proved stronger than the sword, and the Dalai Lama became temporal sovereign of T. At the beginning of the 18th c., in consequence of a prime-minister having concealed the death of the Dalai Lama for some years, the Chinese interfered, and from that time T. became a Chinese province. The Chinese mandarins assume a superintendence over the election of the Dalai Lama and the government of the country. The last election took place in 1875, when a child from western T. was elected. The Chinese government in the past has invariably put every obstacle in the way of the opening up of the country, but by the Chefoo Convention in 1877 has permitted the residence of an English embassy in Lhasa. The famous Lama survey of T. was begun in 1708, and completed in 1718, still the basis of our geographical knowledge of T., though it is now being superseded by the labours of Colonel Montgomerie's pundits. The first Englishman to travel in T. was George Bogle, who was despatched by Warren Hastings in 1744, but was prevented by the Chinese from proceeding to Lhasa, and obliged to return in June 1775. In 1811 Thomas Manning was successful in reaching Lhasa, and he is still the only Englishman who has ever seen 'the holy city.' The only Europeans who have visited it since his time are the French missionaries Huc and Gabet. During the last ten years trained native explorers have been despatched by Colonel Montgomerie, and have added much to our knowledge of T. See Colonel Montgomerie's *Reports of Trans-Himalayan Explorations*, published in the *Journal of the Royal Geographical Society*; E. Schlagintweit, *Buddhism in T.* (Leips. 1863); Desgodins, *La Mission du T.* (Verdun and Par. 1872); Brian Hodgson, *Essays on the Language, Literature, and Religion of Nepaul and T.* (Strasb. 1874); W. T. Heeley in the *Calcutta Review* for July 1874; C. R. Markham, *Narratives of the Mission of George Bogle to T., and of the Journey of Thomas Manning to Lhasa* (Lond. 1876); and Ganzenmüller, *T.* (Stuttg. 1878).

Tibul'lus, Al'bius (his prænomen is unknown), the most graceful and finished of Roman elegists, was born at Pedum, between Præneste and Tibur, *circa* 700 A.U.C. His father seems to have died while he was still very young. Allusion to his father is nowhere made in the works that bear his name, save

in a passage in the *Book of Lygdamus* (iii. 5, 17-18), a work which the majority of critics, since the promulgation of the ingenious theory of J. H. Voss in 1786, have agreed to consider spurious. T., however, speaks of his mother and sister with feelings of tenderest regard (El. i. 3, 4-7). He inherited lands, wealth, and position, but was deprived of his patrimonial possessions in the confiscation of property consequent on Cæsar's death. Some portion thereof had, however, either been left to him, or restored through some friend's intervention. While most of the poets of the brilliant Augustan period—the golden age of Roman literature—enjoyed the patronage of the cultured and courtly Mæcenas, T. attached himself to the coterie of Marcus Valerius Messala Corvinus, whose friendship and favour he enjoyed through life. In 723, A.U.C., he went in that general's suite as aide-de-camp in a descent on the rebel tribes of Aquitaine, and was present in the battle of Atax (mod. *Aude*: see Book i. El. vii. *passim*). In 724 he went with Messala on his Asiatic expedition, but a serious illness prevented his proceeding further than Corcyra (*Corfu*). On his recovery he returned to Rome, and soon after sought his country seat at Pedum, there to spend for the most part the remainder of his days in the pursuits of literature and love. Beyond what has been stated, the life of T., uneventful and comparatively aimless, must be gleaned solely from his elegies. The names or pseudonyms of two ladies at least—Delia and Nemesis—are in his verse destined to imperishable fame. As a man T. possessed intense earnestness, a genial and kindly spirit, and withal a singular disposition to forgiveness. All ancient writers speak of him with unqualified admiration and praise. Some modern *soi-disant* authorities, on the other hand, have decried his sentimentalism and tender melancholy as un-antique. It may be safely assumed that they do not understand him. T. throughout evinces a simplicity, a terseness, a tenderness, and a naturalness unapproached in Roman elegy—the rich and sensuous verses of Ovid and the nervous and brilliant passion-strains of Propertius not excepted. The social virtues of T. were great. His intense love of primitive life and of the simplicity of earlier days will continue to endear him to posterity. In his last illness T. was tended by his mother and sister, with whom his two much-loved mistresses, Delia and Nemesis, met to pay the last tribute at his pyre (A.U.C. 735). The genuineness of the first two Books of Elegies has never been questioned. *The Elegies of Lygdamus* (Book iii.) are, in the opinion of most critics, by a later hand. The fourth Book contains a long and dreary panegyric to Messala, one unquestioned elegy (xiii.) by T. at his best, and a few short poems of exquisite grace and finish by a certain Sulpicia. The *editio princeps* of T., with Catullus, Propertius, and the *Silvæ* of Statius, was printed at Venice by Vindelin de Spira, 1472. The editions of Broukhusius (Amst. 1708), and of Vulpius (Padua 1738-55) are valuable. Those of Dissen (Götting. 1835), J. H. Voss (Heidelb. 1811), Lachmann (Berl. 1829), Haupt (Leip. 1853, 1861, 1868), Rossbach (Leip. 1855), L. Müller (1870) and Bährens (1878). For a critical estimate of the writings of T., and of the genuineness of the Books, see the works of Voss, Wagner, Ritschl, Teuffel, Bender, Cranstoun; also *Catullus, T., and Propertius*, by Rev. James Davies, M.A., in Blackwood's *Ancient Classics for English Readers* (1876). The most recent English version is that by Cranstoun (Blackwood 1872).

Tic Doloureux, or **Fa'cial Neural'gia**, is a painful affection of the fifth nerve. The supra-orbital branch may be alone affected, the pain being confined to the brow and the top of the head; or the three branches may be generally involved, the pain being diffused over the face and head. The attack may be ushered in by some chilliness and uneasiness, and a twinge of pain which begins just above the eye, on one side, and radiates over the head. The pain is at first paroxysmal, but after a time it becomes continuous, and may be excruciating. T. D. is frequently periodic; is more apt to attack females than males during adult life, and is often connected with menstruation, lactation, mental excitement, and exposure to cold. The general treatment of T. D. consists in the administration of quinine, arsenic, strychnine, iron, phosphorus, and cod-liver oil, but quinine is the most efficacious remedy. The hypodermic injection of morphine is especially valuable, and atropine, daturine, ergotine, and other alkaloids, are also used. Electricity is also useful, and it should be applied to the nerve by sponge-covered electrodes, one pole being placed behind the condyle of the jaw, and the other held for a few minutes over the supra-orbital and infra-orbital foramina, or over the symphysis of the lower jaw.

Tichvin', a town of Russia, government of Novgorod, on the Tichvinka, an affluent of the Sias, 161 miles E. by S. of St. Petersburg. It has four churches, a monastery, and a nunnery, and builds river-boats. Pop. (1870) 5969. The *T. canal-system*, 439 miles in length, stretches from the river Mologa to Lake Ladoga, thus connecting the Volga with the Gulf of Finland. It was completed in 1811.

Tici'no (Ger. *Tessin*), the most southerly of the Swiss cantons, is bounded E. by Grisons, N. by Grisons and Uri, and girt on the W., S., and E. by Italy. Area 1087 sq. miles; pop. (1876) 121,768. Occupied in the N. by the Leopontine Alps, of which the chief height is Mount St. Gothard (q. v.), it falls in the S. into the fertile cultivated plain watered by the T., which procures for the canton the name of the 'Italian Switzerland.' The Alpine slopes are clad with extensive forests, and here the inhabitants are mainly engaged in dairy-farming and cattle-breeding. T. includes almost the whole of Lago Lugano, and the N. part of Lago Maggiore (q. v.). The products of the T. comprise wine, corn, olive-oil, and fine southern fruits. In 1876 the exports amounted to 2,952,502 francs, the imports to 3,386,428, and the public debt, on January 1, 1877, to 7,471,594 francs. The inhabitants, who speak Italian, are mostly Roman Catholics. Bellinzona, Lugano, and Locarno are the chief towns. See Eglis's *Taschenbuch Schweizerischer Geographie, Volkswirtschaft und Kulturgeschichte* (2d ed. Zür. 1878).—**T.**, the river, rises on the S. slope of Mount St. Gothard, flows S. through Lago Maggiore, beyond which it is navigable, and joins the Po 4 miles above Pavia, after a course of 120 miles.

Tick (*Ixodes*), the popular name for various species of mites or *Acarina* of large size which infest dogs, sheep, &c. These mites have a leathery and toughened skin, the maxillæ are three or four-jointed, and the saw-like mandibles have terminal hooks by which the animals adhere to the skin of their host. The legs, numbering eight, are slender and clawed. *I. ricinus* is the common T.; other species are *I. bovis*, *I. unipunctata*, and *I. albipictus*. The dog T. (*I. plumbeus*) is so named from its dull leaden colour. In tropical countries the attacks of the T. are often exceedingly painful. The Tampan (q. v.) is a well-known tropical form of T.; so also is the 'Carapta' of Brazil, which infests dry situations and trees, and is thus enabled to transfer itself to the bodies of passing quadrupeds.

Tickell', Thomas, a minor English poet, was born at Bridekirk, Cumberland, in 1666. After studying at Oxford, where he became Fellow of Queen's College in 1710, he obtained from Addison the office of under-secretary of state in 1717, and about seven years later was appointed secretary to the Lords Justices of Ireland. He died in 1740. T. is mainly remembered by his translation of the first book of *Homer*, his *Elegy on Addison*, and his contributions to the *Spectator*. The first of these has transmitted to modern times a curious question as to its authorship and the circumstances of its birth; for it happened to come out about the same time as Pope's translation, and the suspicious poet averred that it was really the work of Addison, and was issued with a hostile intention towards himself. Dr. Johnson, Goldsmith, and Macaulay agree in high admiration of the *Elegy*, while Steele maintained that it was only prose in rhyme. T.'s poems are collected in vol. xi. of Chalmers' *English Poets*, and an American edition appeared at Boston in 1854.

Ticket-of-Leave is a licence granted to a convict, on account of good conduct, to be at large. It may be granted, under the Act of 1864, to male convicts after three-fourths of the period of sentence has been passed, and to females after two-thirds. It is revocable in case of misconduct, or relapse into crime.

Tick'ing, a strong linen or cotton fabric, striped, and commonly twilled, used to hold feathers, hair, or other material for beds, mattresses, &c.

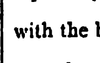
Tick'nor, George, LL.B., born at Boston, U. S., 1st August 1791, graduated at Dartmouth College (1807), and was called to the bar (1813). A year's experience showed his unfitness for a legal career, and in 1813 he sailed for England, whence, having made acquaintance with Roscoe, Byron, and Sir Humphrey Davy, he proceeded to Göttingen, his residence for eighteen months. During this period he studied, twelve hours a day,

theology, five languages, and natural history; then, having visited Goethe at Weimar, he proceeded to Paris, Geneva, and Rome, being everywhere admitted to the best society. Part of 1818 he spent in Spain, gathering Spanish books and mastering the language; these ends achieved, he travelled back over Paris to England, where he now met Southey, Wordsworth, Scott, and all the coterie of Holland House, and in 1819 returned home to become professor of modern languages at Harvard. Here he continued fifteen years, busied with educational and philanthropic schemes, promoting college reforms, writing for the *North American Review*, and entertaining Lafayette as his guest in 1824. The death of an only son (1834) led T. to resign his professorship and take his family for a three years' tour in Europe, during which he collected further materials for his *History of Spanish Literature* (3 vols. 1849; new ed. 1871), the exhaustive, accurate work on which his reputation is surely founded. Besides short sketches of Lafayette (1825), Daniel Webster (1831), the Buckminsters (1849), Everett (1865), &c., T. published a Life of Prescott (1864), and he was one of the chief founders of the Boston Public Library, to which he presented 2000 volumes. Never illiberal but a Conservative in politics, no abolitionist though hating slavery, the upright, keen-witted, and appreciative friend of most men worthy of his friendship, T. passed his later years in quiet usefulness, and died at Boston, 26th January 1871. See Hillard's *Life, Letters, and Journals of G. T.* (2 vols. Bost. and Lond. 1876), the most interesting biography America has yet produced, containing as it does memorials of Mdme. de Staël, Mdme. Recamier, Chateaubriand, Humboldt, Guizot, Bunsen, Niebuhr, Talleyrand, &c.

Ticondero'ga, a town in New York, U.S., at the outlet of Lake George into Lake Champlain, 80 miles N. of Albany by rail. The outlet is 4 miles long, with a fall of 220 feet, and the water-power supplies many timber, woollen, and cotton mills. Graphite, found in the township, is used in making pencils and crucibles. Pop. (1875) 3401. The promontory was long occupied by the fort of Carillon (1755), so called from the sound of the neighbouring waterfalls. This fort, now a ruin, was Montcalm's headquarters in 1757, was taken by Amherst in 1759, by Ethan Allen in 1775, and by Burgoyne in 1777. See *History of T.* by Rev. Joseph Cook (Keeseville 1858).

Tides are the regular periodic oscillations to which the surface of the sea at any place is subject. The oscillation takes place about twice a day, the periodic time being, on an average, about 12 hours and 26 minutes. Consequently if high tide occurs at noon one day, it will occur next day some fifty minutes later. This is precisely the interval of time which elapses between two successive meridian passages of the moon; and that there must be some connection between the tides and our satellite was early recognised by astronomers. The explanation, however, was lacking until Newton proved them to be a necessary consequence of the law of gravitation. The phenomenon of the T. is, indeed, a case of perturbations, of exactly the same nature as the irregularities which the action of the sun produces in the motions of the moon. If we compare the attraction of the moon upon a particle of the earth's surface with the attraction exerted upon the earth as a whole, we readily see that, according as the particle is on the nearer or further side of the earth, the former attraction is greater or less than the latter; and it is to this *difference* of attraction, to which the waters yield, that the whole phenomenon of T. is due. The nearer waters are driven *towards* the moon, the further waters *away* from it. If the earth were spherical and uniformly covered with water, the tendency would be to make the water arrange itself in the form of a spheroid with the longer axis pointing towards the moon; and did the earth always present the same face to the moon, this would be rigorously the case. Such is the *equilibrium* theory of T., as originally given by Newton. It accounts so far for the phenomena, such as the simultaneous existence of high water at places diametrically opposite, but does not even approximately correspond to the true state of affairs. Newton was fully aware of this, and indeed has given the solution of the problem upon other and truer assumptions. If the hypothetical earth covered uniformly with water is rotating, so as to present each point of its surface successively to the moon, each particle of water will be moving with a certain momentum which will be suffering retardation or acceleration according to its position relatively to the moon. The longer diameter of the water ellipsoid will consequently not point in the direction of the moon; and the result will be the formation of two diametrically opposite waves, flowing round the earth in a direction contrary to its rotation. This is the kinetic theory, which forms the basis of Laplace's theory of T. It also fails in practical application, since the continuity of the surface waters on the earth is very much broken by the distribution of land. More recently Young and Airy have approached the question as one of wave motion, basing their theory upon the motion of waves in canals. Till now we have been regarding the moon as the sole tide-producing agent, but it is evident that the sun must have a similar action, though not so marked because of its much greater distance. It was proved by Newton that the disturbing forces exerted by two bodies upon the same particle are directly as their masses, and inversely as the cubes of their distances; hence the ratio of the disturbing force exerted by the sun to that exerted by the moon 7 : 16. The principal tidal wave is that caused by the moon, but upon it must be superposed that due to the sun. When the sun and moon are in *syzygy, i.e.*, at times of new and full moon, their tidal waves will be superposed crest upon crest, and the effect will be what is called a *spring-tide*. When they are in *quadrature*, trough will coincide with crest, the lunar tide will be partially neutralised by the solar tide, and the result will be the so-called *neap-tide*. The average spring-tide will be to the average neap-tide as $16 + 7 : 16 - 7 = 23 : 9$. Besides this effect in amplitude, another effect is caused by this combination of the T., namely the *priming* and *lagging* of the T. For when the two vertices do not coincide, the maximum of the resultant tidal wave will be at a point intermediate to the vertices, so that the time of high water will be now in advance now behind the time it would have been had the moon been the sole agent. Not only, then, are the waters of the ocean subject to diurnal and semi-diurnal oscillations, but these are subject to a monthly, semi-monthly, and even annual variation, besides being more or less affected by prevailing winds and coast configuration. The height of the tidal wave which circulates round the earth is not great—at most some 7 feet, a very small quantity compared to the size of our globe. In estuaries, bays, creeks, straits, &c., however, the difference between high and low water is much greater than this—as much as 50 feet in the Bay of Fundy, Nova Scotia. The explanation of such phenomena is to be found in the momentum with which the water is pushed forward by the advancing wave. In such a sea as the Mediterranean, which is all but cut off from communication with the great oceans, and which is itself not sufficiently extensive to be very perceptibly acted upon by the sun and moon, the T. are very small, not exceeding a few inches.

The attempt to establish a complete theory from abstract principles has proved a failure; and the only true method by which to get an insight into the particular laws which govern tidal action at any given place is continued observation. By means of Sir William Thomson's tide-gauge a graphical representation of the tidal oscillation at any place can be easily obtained; and by harmonic analysis of the curve, the constituent factors may be easily discovered, and the comparative effects of their several causes estimated. One efficient cause in retarding the T. has not been mentioned, namely fluid friction, which, as first noticed by Kant, must act as a continual *break* to the earth in its rotation; and this gradual slackening in the earth's speed of rotation must go on until the day is of the same length as the lunar month, when matters will be as required in the equilibrium theory given above. See Newton's *Principia* (Book III., prop. 24, 36, 37); Laplace's *Mécanique Céleste*; *Young's Works* (edited by Peacock, 1855), and Airy's 'T. and Waves' in the *Encyclopædia Metropolitana*.

Tie, in music, also called a bind or ligature, is a curved line drawn over two or more notes on the same degree of the stave,  indicating that the second note is not to be sounded separately, but is to sustain the first. When dots are associated with the bind  the notes are not tied, but are to be played *mezzo-staccato*, in a detached but not crisp manner. A line placed over notes of different degrees  is called a

slur, and indicates that the notes are to be played *legato.* To prevent confusion between tied and slurred notes, Sir W. S. Bennet introduced the sign ⌐¬ instead of ⌒ for a tie, an example that might have been more generally followed with convenience.

Tieck, Ludwig, a German novelist and poet, the most brilliant representative of the romantic school, was born at Berlin, 31st May 1773. He studied at the Universities of Halle, Göttingen, and Erlangen. After spending some years at Jena, Dresden, and Munich, T. was forced on account of his health to go (1805) for a year to Italy. On his return he lived principally at Ziebingen till 1819, when he went to Munich. When Friedrich Wilhelm IV. of Prussia ascended the throne T. was summoned to court, received a considerable pension, and was honoured with the title of privy councillor. He died at Berlin, after a long and lingering illness, 28th April 1853. T.'s long life was a period of almost continuous literary activity. It falls naturally into two periods. In the first the romantic 'note' is heard much more distinctly than in the second, and the subjects are taken from the history, folklore, or superstitions of the Middle Ages. The mystic element is everywhere apparent. *Abdallah* (Berl. 1795), *William Lovell* (3 vols. Berl. 1795), and *Peter Lebrecht* (2 vols. Berl. 1795-96), were his first considerable works. These are chiefly noteworthy for the promise of excellence which they contain. They show strength, but it is wild and immature. In rapid succession followed *Peter Lebrecht's Volksmarchen* (3 vols. Berl. 1797); the comedy of *Die Verkehrte Welt; Romantische Dichtungen* (2 vols. Jena 1799-1800), containing *Zerlino*, a clever attack on the Anti-Romanticists in the form of a continuation of the fairy tale of *Puss in Boots*, which he had already treated in the *Märchen; Leben und Tod der Genovera*, a legend of the Middle Ages exquisitely reproduced. A translation of *Don Quixote* (4 vols. Berl. 1799-1801) next engaged his attention, and this was followed in 1804 by *Kaiser Octavianus*, one of the best examples both of the merits and the faults of the romantic school. A pause followed, and it was not till eight years later that his next work, *Phantasus* (3 vols. Berl. 1812-15, new ed. 1844), appeared. This was really a new edition of the *Volksmärchen*, but considerably enlarged and improved, and is T.'s best work. It is chiefly a reproduction of old German legends and popular stories, bound together by a number of critical dialogues. Among the best are 'The Trusty Eckart,' 'The Runenberg,' and 'The Elves.' The last is the finest modern fairy tale in existence; it was translated, along with stories of T., by Carlyle (1827). T.'s second period is distinguished by a more moderate phantasy, an almost entire abandonment of the magic element, and an approximation to the form of the modern historical novel. In a new edition of Ulrich von Lichenstein's *Frauendienst* (Tüb. 1815), and in the *Altdeutsches Theater* (2 vols. Berl. 1817), we have the results of historical researches in old German literature. The *Aufruhr in den Cevennen* (Berl. 1826), *Der Junge Tischlermeister* (2 vols. Berl. 1836), and *Vittoria Accorombona* (2 vols. Bres. 1836, new ed. 1841), are three novels, of which the first is one of the best and the last one of the worst things that T. ever wrote. A prolonged study of Shakespeare and his surroundings resulted in *Das Altenglische Theater* (2 vols. Berl. 1811), *Shakespeare's Vorschulte* (2 vols. Leip. 1823-29), the completion of the magnificent translation of the great dramatist which A. W. Schlegel had begun, and *Dichterleben* (in the *Urania* for 1826), a brilliant novel, in which Shakespeare and the greatest of his contemporaries are introduced. T. is now little read in Germany; the current of his country's literature has turned in another direction. Yet he was one of those men who have secured a permanent place in literature. The Middle Ages existed in his mind as a living reality, and he has reproduced with vivid exactness the beauties of a long-distant past. He has the best characteristics of the romantic school—its regard for nobleness of character and purity of life, its love of the beautiful in nature, its childlike simplicity that often contains so deep a meaning. He has often its faults—obscurity, want of form, irregularity of development. His genius was wild and sometimes extravagant, but it was also deep, rich, and various. Collections of T.'s writings have been published in the following forms:—*Gedichte* (3 vols. Berl. 1821; new ed. 1841), *Sämmtliche Werke* (20 vols. Berl. 1828-42); *Nachgelassene Schriften*, edited by Köpke (2 vols. Leip. 1855). See Köpke's *Ludwig T. Erinnerungen aus dem Leben des Dichters* (published with the last-named work), and Hoffman's *Ludwig T., eine Literarhistorische Skizze* (Nürn. 1856).—**Christian Friedrich T.**, an eminent sculptor, brother of the foregoing, was born at Berlin, 14th August 1776, and died 14th May 1851. He executed busts and statues of a large number of the most eminent of his countrymen, and had a share in the planning of many of the finest buildings in the German capitals.

Tiel, an old town of Holland, in Gelderland, on the right bank of the Waal, 20 miles W. of Nijmegen. It has good docks and quays, and carries on an active trade in the produce of the fertile Betuwe. Pop. (1877) 7598.

Tien-tsin, an important city and river-port of China, province of Chih-le, on the right bank of the Peiho, 68 miles from Taku at its mouth, and 80 S.E. of Pekin, of which it is the port. It is surrounded by a wall, and most of the houses are built of sun-dried bricks. Many of the streets are well paved and spacious. By the destruction by fire of an asylum for women and children, 2000 lives were lost, according to a telegram from Shanghai dated 2d February 1878. The foreign settlement included in 1877 the residences of official consuls for Great Britain, France, Germany, Russia, and the United States, of an official vice-consul for Japan, and of merchant consuls for Sweden and Norway. The construction of a telegraph line between T. and Taku is in progress (1879), and the Chinese officials are promoting a scheme for the formation of a railway between the two places. The temperature at T. ranges from 106° F. to 6° below zero, and the river is generally frozen from 15th December to 15th March, during which period business is actively carried on by sledges. In 1877 there entered and cleared the port 924 vessels of 528,308 tons, and of these 404 of 293,694 tons were Chinese, 382 of 187,882 tons British, 78 of 22,626 tons German, and 36 of 17,118 tons American. In 1876 the Chinese Steam Company, largely subsidised by the Government, took over the American 'Shanghai Steam Company,' and the purchase raises the Chinese returns by 211 vessels and 145,387 tons. The value of imports amounted (1877) to £6,347,771, including £4,020,614 of 'native' imports; and of exports to £534,963. The foreign imports are chiefly cotton and woollen goods, metals, and opium, while among the sundries appear 13,002 gross of matches, 4190 boxes of window glass, and 213,000 of needles. Rice, wheat, millet, tea, &c., are native imports; the exports include tobacco, dates, rhubarb, camels' wool, and straw braid. The last two articles are now the specialties of the port. Estimated pop. (1877) 950,000. T. was opened to foreign trade in 1860.

Tierce. See FENCING.

Tier'ney, George, a London merchant's son, was born at Gibraltar, 20th March 1761, from Eton passed to Peterhouse, Cambridge, and graduated LL.B. (1784). Called to the bar, he published *The Real Situation of the East India Company* (1787), and in 1796 entered Parliament, where he rose by his powers of debate to be leader of the Whigs. In 1798 he fought a duel with Pitt, on whose retirement from office in 1803 T. was appointed Treasurer of the Navy, subsequently becoming Secretary of State for India and President of the Board of Control (1806), head of the Opposition (1817), and Master of the Mint (1827). He died in London, 25th January 1830.

Tierr'a del Fue'go (Span. 'land of fire'), an archipelago separated from Patagonia by the Strait of Magellan, consists of 11 large and 20 small islands, with an aggregate area of about 26,570 sq. miles, of which the largest island, called King Charles's South Land, forms three-fourths. The group appears to be a prolongation of the adjacent continent, like which its western coasts are indented by deep inlets, while the eastern coast is tolerably regular. All the islands are rugged and mountainous, and Mr. Darwin says that 'to find an acre of level land in any part of the country is most rare.' The highest peaks are Mounts Sarmiento (6910 feet) and Darwin (6800 feet). Impenetrable forests clothe the mountain sides from the water's edge to a height of 1200 feet, and are succeeded by alpine plants up to 3500 feet, which is the limit of perpetual snow. Volcanic products abound almost everywhere, whence the name of the group. The climate is extremely wet and stormy all the year round, and the ground is covered with a thick bed of always soaking peat. The forests are composed principally of the evergreen *Fagus betuloides*, with frequent specimens of the deciduous Antarctic

beech (*Fagus antarctica*), and the handsome Winter's-bark tree (*Drimys Winteri*). The dog, guanaco, otter, seal, and whale are the only mammals found, but waterfowl of many kinds are very numerous. The aborigines, who are among the lowest in the scale of humanity, are of a coppery-red colour, with black hair, and daub themselves with white paint. The life of the natives is a constant struggle for existence, their food consisting of shell-fish, berries, and fungus, with fish and blubber when obtainable. Their canoes are of the most wretched kind, and they are ignorant of fish-hooks. Their numbers probably do not much exceed 2000. An attempt made in 1850–51 to establish a mission station in T. D. F. resulted, through mismanagement at home, in the death of the entire party of seven by starvation. Another expedition with a similar object, made in 1854–55, also proved a failure, but the labours of Bishop Sterling of the Falkland Islands were reported in 1878 to have been successful in stirring the natives to habits of industry.

Tiers État. See STATES-GENERAL.

Tif'lis, a government of Asiatic Russia, extending on both sides of the river Kur from the central chain of the Caucasus Mountains on the N. to the Armenian plateau on the S. Area 15,622 sq. miles; pop. (1873) 662,859 (24 per cent. Mohammedan). Steppes and fertile plains are found in the centre, but much of the surface is mountainous, covered with offshoots from the Caucasus and Mount Ararat, reaching in some peaks to 12,000 feet. The soil is fertile and yields abundant tobacco, cotton, indigo, wheat, and fruit. Numerous rich petroleum springs and mineral wells exist, and excellent timber is produced from the extensive forests of oak, elm, maple, and chestnut.—**T.**, capital of the preceding government, and chief city in the territory of the Caucasus, lies in a narrow valley on both sides of the Kur, 184 miles E.S.E. of Poti by rail. In its architecture and in the manners of its inhabitants the city presents a singular mixture of Asiatic and European features. The city is the seat of the civil and military authorities of Transcaucasia, and has 42 churches (23 Armenian), 2 mosques, a gymnasium, and several upper schools, a library, a botanic garden, a hospital, and a theatre. It has active manufactures of woollens, silks, cottons, armour, and leather, and is the emporium for the important Russian trade with Persia. It is already connected with Teheran by telegraph, and the Russian government has recently arranged to connect it also by rail. In 1876 there were imported from foreign countries and cleared at T. goods to the value of 1,647,266 roubles, of which the principal articles were sugar 666,700 roubles, manufactures 460,600, metals 77,500, tea 59,980, tobacco and cigars 59,890, chemicals 51,620, paper and stationery 26,920, and wines 15,856. Pop. (1873) 70,591.

Ti'ger (*Tigris regalis*), a well-known species of carnivorous mammalia inhabiting Southern Asia generally, and also Java and Sumatra. The distinctive characteristics of the T., of which but one well-defined species (the royal or Bengal T.) is known, are the absence of a mane, and of any tuft on the tail, a leonine shape generally, but with greater symmetry, the fore parts of the body exhibiting no such large development as in the Lion (q. v.). The colour of the T. is very conspicuous and characteristic. The ground colour of the fur is a reddish-yellow hue, often approaching the tawny in its tint, while disposed upon this ground are black stripes of crescentic form, which run transversely to the long axes of the body. The under parts are white, and the tail, like the body, is encircled with dark rings. Occasional specimens of the T. have been found in which these markings have given place to a uniform white colour. The T. is even more bloodthirsty and dangerous than the lion. It is more lithe and agile; its spring is more stealthy and powerful; and in disposition it is treacherous. It usually lies concealed during the day and hunts at night. Its favourite haunt is close by some water pool, from a near eminence of which it may spring upon the animals which come to drink. Sometimes the T., growing bold by successful forays, approaches the habitations of men, and may carry off sheep, cattle, and even attack human beings. T.-hunting is a dangerous but highly-exciting Indian sport. The animal is pursued on elephants, and the sportsmen and their huge bearers are occasionally liable to suffer from the spring and furious onset of their game. The T. is also captured in pit-falls, and a curious method of taking it is to smear leaves with bird-lime; the T. treading on the leaves, then smears its face with the bird-lime to get rid of the leaf, and thus effectually blinds itself, when it becomes an easy prey to the rifle. The length of a full-grown Bengal T. from the tip of the muzzle to that of the tail, is about 15 feet, but larger specimens are by no means unknown. In ancient times the T. was exhibited in the shows and spectacles of the Roman emperors. A hybrid offspring is not unfrequently produced by the union of the male lion and the tigress, the cross being striped and not maned.

Ti'ger Bee'tle (*Cincindela campestris*), a species of beetle belonging to the Pentamerous section of the order *Coleoptera* (q. v.). The head is broader than the *prothorax*, the jaws are long and curved, and the legs are slender. The colour is brownish, marked with lighter dots and stripes. The T. B. is common in sandy places, and on the shores of rivers and ponds. It runs swiftly, and is difficult to capture. *C. campestris* and *C. vulgaris* are familiar species.

Ti'ger Cat, a term used to denote many species of smaller *Felidæ* or cats resembling the Tiger (q. v.) more or less closely. The ocelot and serval are thus named; but perhaps the most distinctive genus included under this designation are the Margay or T. C. (*Felis tigrina*), and the Chati (*Leopardus mitis*), both of which belong to S. America. The Chati attains a length of about 2 feet, the tail measuring an additional 11 inches.

Ti'ger Flower (*Tigridia*), a genus of bulbous *Iridaceæ*, named from the flowers of *T. Pavonia* being richly spotted on a yellow or red ground. Their beauty, though evanescent, makes them favourites in gardens. They are indigenous to tropical America.


Tigridia Pavonia.

Tighe, Mrs. Mary, an Irish poetess, born in Dublin, in 1774, and married her cousin, Henry T., of Woodstock, M.P., in 1793. Though her poem *Psyche, or the Legend of Love*, was privately printed by C. Whittingham (Lond. 1805), it was only after her death, which took place March 24, 1810, that her writings were given to the world. The first edition was in 1811, and they have been frequently reprinted. The *Psyche* is written in the Spenserian stanza; and at least, by Leigh Hunt's admission, occasionally contains a fancy not unworthy of a pupil of Spenser. Her other poems are short occasional pieces, frequently of a religious cast. It is probably as the subject of Moore's lyric, 'I saw thy form in youthful pride,' and of Mrs. Hemans's *Grave of a Poetess*, that Mrs. T. is destined to be longest remembered.

Tigré. See ABYSSINIA.

Ti'gris (Old Pers. *Tigra*, 'an arrow,' Assyr. *Chiddekel*, Armen. *Deklath*, Arab. *Didschle*), next to the Euphrates the greatest river of Asiatic Turkey, rises on the S. slope of the Armenian Taurus range in Kurdistan, to the S. of Lake Goljik. It has a sinuous course in a S.-easterly direction, almost parallel to that of the Euphrates, which river it joins at Kurna, after a course of 1060 miles. The joint stream, called the Shat-el-Arab (q. v.), after a further course of 90 miles, enters the head of the Persian Gulf. In its upper course the T. flows through fine pasture-land, frequented by nomad Kurds and Arabs, and from Diarbekir, where it becomes navigable for small craft, to Mosul, a distance of 200 miles, its banks are highly cultivated in some places. Below this point, again, as far as Bagdad (250 miles), it traverses unpeopled wastes, while from Bagdad to its mouth the steep banks are overgrown with high reeds and brushwood, and are haunted by lions and other beasts of prey. Its affluents, the Bitlis, Great and Little Zab, and Dyala, all flow from the highlands to the N., the country separating it from the Euphrates being a streamless waste. The chief places on the T. are Diarbekir, Mosul, and Bagdad, and the ruins of Nineveh, Seleucia, Ctesiphon, and Opis. Like the Euphrates, the T. rises in

spring with the melting of the snow on the Armenian mountains; and during the latter half of May, when the flood is at its height, the whole country between and beyond these rivers, for over 100 miles between Bagdad and Bussorah, is converted into a lake. The 'arrowy' stream either loses less water by irrigation or receives more from its affluents than the Euphrates, for it is the larger of the two at the point of confluence.

Til'burg, a town of the Netherlands, province of S. Brabant, 48 miles S.E. of Dortrecht by rail. T. has an archbishop's palace, 4 Roman Catholic churches, a Reformed church, a synagogue, and large manufactures of cloth, cottons, woollens, carpets, and leather. Pop. (1875) 25,397.

Til'bury Fort, on the Essex bank of the Thames, opposite Gravesend, was founded by Henry VIII. as a blockhouse and strengthened by Elizabeth, who here harangued the troops mustered to repel the Armada (1588), as also by Charles II. in 1667. It is now a rectangular brick building, girt by a fosse, and had a garrison in 1871 of 148 men.

Tiles (Fr. *tuiles;* Lat. *tegulæ*, from *tego*, 'I cover') are manufactures in burnt clay, used for surfaces, such as floors, walls, and roofs. There are also oven T., which are perforated for the passage of heated air; and drain T., used extensively in agriculture. T. also vary very much in quality, the commoner kinds being of the same material as ordinary bricks, although generally a purer and tougher clay is used. Encaustic and other ornamental floor T., on the other hand, are made of very superior materials, faced with fine pottery 'slips,' and moulded with the greatest care; and the 'majolica' painted and glazed T., now extensively used for walls, grates, and mantel-pieces, are in many instances works of art. See ENCAUSTIC T.

Tile'stones, a group of rocks referred by Sir R. Murchison to the base of the Devonian system, and subsequently looked upon as 'Transition beds' between that formation and the Silurian. Now, however, from the evidence of their organic remains, they are usually classed with the Ludlow formation, of which they form the highest subdivision. They are typically displayed at Downton Castle near Ludlow, and are hence often known as 'Downton beds.'

Tilia'ceæ, a natural order of thalamifloral polypetalæ, numbering about 350 species of trees, shrubs, or rarely herbs. The properties are usually mucilaginous, and the inner bark of many species yields fibre, thus pronouncing affinity with *Malvaceæ* (q. v.). The order, which is chiefly tropical and sub-tropical, is in these zones spread over both the New and the Old World, with one extra-tropical genus (*Tilia*) in the northern, and another (*Aristotelia*) in the southern hemisphere. To this family belong *Berrya ammonilla* of Ceylon which yields Trincomalee wood, the lime-trees of Europe, and *Corchorus capsularis* furnishing the Jute (q. v.) of commerce. The fruit of various species of *Grewia* is eaten in India, their bark-fibre serves for cordage, &c., and their wood is useful timber. In the large genus *Elæocarpus* an excellent and permanent dye is obtained from the Hinau (*E. Hinau*) of New Zealand. *Luhea divaricata* of Brazil supplies a very close-grained light wood, and the bark of *L. grandiflora* is used for tanning.

Till. See BOULDER CLAY, DRIFT, OR TILL.

Tilland'sia. See BROMELIA'CEÆ.

Tille'mont, Louis Sebastien le Nain de, born in Paris, November 30, 1637, was educated at Port-Royal, and after receiving the tonsure proceeded (1656) to the seminary of Beauvais. Ordained sub-deacon in 1672 and priest in 1676, he withdrew to the abbey of Port-Royal (1677), and on its dissolution two years later settled upon his family estate of Tillemont, between Vincennes and Montreuil. To visit Antoine Arnauld (q. v.) and other Jansenist exiles, T. travelled to Belgium (1681), and he died in Paris, January 10, 1698. Of T.'s historical works—impartial, accurate, but prolix and dry—the chief are *Histoire des Empereurs et des autres Princes, qui ont régné pendant les six premiers Siècles de l'Église* (6 vols., 1690–1738); and *Mémoires pour servir à l'Histoire Ecclesiastique des six premiers Siècles* (16 vols. 1693–1712). See the works cited under PORT-ROYAL, and Tronchay's *Vie de T.* (Nancy, 1706).

Till'er, the handle of the Helm (q. v.), by which the Rudder (q. v.) is turned.

Tillicoult'ry, an industrial town of Scotland, county of Clackmannan, on the Devon, 2 miles E. of Alva and 9 N.E. of Stirling by rail. It is the seat of an important woollen trade, and has several large mills engaged in the production of shawls, plaids, and tartans. Coal and limestone are extensively wrought in the vicinity. There are five churches. Pop. (1871) 3745.

Tillodon'tia, an order of Mammalia recently constructed by Professor Marsh of America to include certain peculiar extinct quadrupeds, the remains of which occur in the Eocene Tertiary rocks of the United States. The molar teeth in the T. have grinding crowns, and resemble those of *Ungulata*. Small canine teeth are developed, and each jaw has two very long incisors, similar to those of *Rodentia*, these growing, like the incisors of the last-named forms, from persistent pulps. The feet, like those of bears, are *plantigrade*, and possessed of five toes each. The femur has a third trochanter. Of this curious order the typical genus is *Tillotherium*, in which form the characters of ungulata, carnivora, and rodentia appear to be united. The average size of these remarkable extinct mammals was that of the Tapir.

Till'otson, John, one of the most eminent of Anglican divines, was born of Puritan parents at Sowerby, near Halifax, in 1630. He was educated at Cambridge for the clerical profession, and took the degree of M.A. in 1654. While he was at the university, and during the years that immediately followed, careful reading and intercourse with cultivated men like Cudworth, More, Smith, Rust, and Wilkins, had their full effect on a mind naturally susceptible to liberal impressions, and consequently in 1662 he felt no difficulty in conforming to the Act of Uniformity. His subsequent rise was rapid. In 1663 he became rector of Keddington, in 1664 preacher of Lincoln's Inn, in 1670 prebendary, and in 1671 Dean of Canterbury. T. gave in his adhesion to the Revolution. He enjoyed the intimate friendship and respect of King William, who almost forced upon him in April 1691 the see of Canterbury, vacant by the deposition of Sancroft. T.'s episcopate was a troubled one, for his moderate opinions made him distasteful to the extreme men of all parties; but he performed the duties of his important office with tact and discretion. Among other things he planned a scheme for restoring a large body of dissenters to the Church, but he was not spared to carry it out. He died 20th November 1694. In English literature T. is best known by his *Sermons*, once immensely popular, though now little read. They brought his widow 2500 guineas. They are moral discourses containing plain homely truths in distinct direct language. Their popularity was partly at least due to the fact that they very fairly represented one phase of that theological Utilitarianism which in his time was the real belief of the average English mind. T.'s works were published in 3 vols. Lond. 1707–12; the best edition is by Birch (3 vols. 1752). See also Birch's *Life of T.* (Lond. 1752).

Till'y, Johann Tserclæs, Graf von, one of the most notable generals of the Thirty Years' War, was born in Brabant in 1559. He was at first educated under Jesuit supervision for the priesthood, but a strong bias towards a military career soon showed itself, and he abandoned the church for the army. He served under Alva during the revolt in the Netherlands, and afterwards with distinction in Hungary. Maximilian, Duke of Bavaria, appointed T. commander of his forces, and in 1620, two years after the beginning of the Thirty Years' War, he utterly routed the Bohemians. During the next period of the contest he defeated in turn the two Protestant leaders. In 1622 T. drove from the Palatinate Christian, Duke of Brandenburg, and in August next year defeated him in a three days' engagement at Stadtloo in Münsterchen. In 1625 he led the army of the Catholic League against Christian IV. of Denmark, who commanded the army of Lower Saxony, and defeated him in the battle of Lutter. Along with Wallenstein (q. v.) he forced the Danish king to agree to the disgraceful peace of Lübeck (1629). Next year Wallenstein was forced to resign the command of the imperial forces, and T. succeeded him. In May 1631 T. sacked with ferocious cruelty the town of Magdeburg. As he himself complacently wrote, since the destruction of Troy and Jerusalem nothing had equalled it. Gustavus Adolphus (q. v.) was too late to save, but not to avenge, Magdeburg. In September 1631 he defeated T. at Breitenfeld, and again at Rain

on the Lech. In both battles, T. was wounded. He died at Ingolstadt, 30th April 1632, a few days after his second defeat. T. was an able general, but a man of narrow intellect. Not personally ambitious, nor caring for money, he was a fanatical Roman Catholic, ready to sacrifice everything for his church. See Klopp's *T. im Dreizigjährigen Kriege* (2 vols. Stutt. 1861).

Til-Seed. See RAM-TIL.

Til'sit, a town of Prussia, province of Preussen, at the junction of the Tilse with the Memel or Niemen, which is crossed by a fine railway bridge (1875), 53 miles S.E. of Memel by rail. It has a Schloss (built 1537, partially burnt 1876), a fine Rathhaus, four churches, two hospitals, a gymnasium (since 1586), a Realschule of the first class (1839), and a large barrack. T. manufactures paper, leather, linens, woollens, and beer, has iron-founding and sugar-refining, and considerable commerce in horses, timber, corn, and produce. Pop. (1875) 19,787. T. is historically interesting as the place where, on a raft in the river, the peace of 1807 was concluded between Napoleon, Alexander, and Friedrich Wilhelm III., by which the last was deprived of one-half of his dominions.

Tim'ber (Old Eng. *timber:* Comp. Ger. *zimmer*, perhaps allied to Gr. *demō*, 'I build') means all kinds of wood, common or ornamental, used in building. T. in carpentry denotes a piece of wood in a frame; and in shipbuilding one of the curved ribs which spring up from the keel. T. sawn, split, sliced, or shaved is called *lumber* in America. The trade in T., already of enormous extent, is annually expanding.

Law Regarding T.—It belongs to the owner of the land. An ordinary lease does not empower the tenant to cut T., but he is entitled to cut and use the underwood, and also to take sufficient wood for repairs (see HAYBOTE). A life-tenant is also entitled to take wood for repairs, and to T. which has been blown down; but he is not entitled to fell trees, unless the estate has been given to him without Impeachment of Waste (q. v.). If the root of a tree extend under the soil of two proprietors, the tree belongs to the owner of the land in which it was sown or planted. Stealing trees or injuring them is a statutory offence, punishable by fine, imprisonment, or penal servitude.

Tim'ber Trees are all trees yielding wood used for constructive purposes. The trees indigenous to a country are first utilised, but as knowledge and means accumulate, the forest vegetation of the world at large becomes available for a wealthy nation. The temperate regions yield the largest supply of T. T.; the oak, elm, beech, ash among exogenous trees, and the pine, spruce, larch, and other conifers in the northern hemisphere, the *Eucalypti* of Australasia, and the valuable produce of New Zealand in the southern hemisphere, being of the highest importance; whilst from the tropical zone come teak, mahogany, and many others. The destruction of T. T. has caused a marked deterioration in the productive capacity of those countries where it has been carried on to excess. All civilised governments now insist on conservation; trained officials regulate the felling, and see that the devastated districts are re-stocked.

Tim'brel (a corruption of Sp. *timbal*), a drum or tabour, used from a very remote age. It is somewhat like a tambourine.

Timbuk'tu, a city of the Sudan, in 17° 37′ N. lat. and 3° 5′ W. long., 6 miles N. of the Niger at the most northerly point of its course. The town is triangular in shape, and at present is less than three miles in circumference, though formerly it was much larger. The wall or rampart which surrounded it was destroyed by invaders in 1826, and has not been rebuilt. The streets are for the most part straight and unpaved, with a gutter in the centre. Most of the houses are of clay, and some are two storeys high, a very unusual thing in Negroland. On the outskirts there are a good many conical huts of matting. Of the mosques, two are especially noteworthy from their great size and imposing appearance, viz., that of Sankoré in the northern, and the Great Mosque in the western angle of the town. The latter is 286 feet long and 212 feet wide. T. has also two markets. The climate is unhealthy, and the surrounding country being desert, or nearly so, all supplies of food are brought by the Niger from Sansanding (q. v.) to Kábara, the port of T. The manufactures of T. are confined to a little iron work, and to leather bags, pouches, cushions, &c., made by the Tuarick women. The place owes its importance entirely to its commercial situation, which makes it the *entrepôt* for the trade between the N. and S. of the Sahara. In addition to the Niger there are two main channels by which commerce flows to T., viz., the caravan routes from Morocco on the N., and Ghadames on the N.E. The principal articles of trade are gold in rings, salt, English calico, red cloth, cutlery, looking-glasses, rice, negro corn, kola nuts (a substitute for coffee), ginger, tobacco, dates, and tea. The resident pop. of the town is about 13,000, but in the trading season, from November to January, is from 5000 to 10,000 more. T. was founded towards the end of the 11th c., and became known to Europeans in 1373. See BARTH.

Time, in music. Every musical phrase is divided into certain portions called bars, and the T. depends upon the number of beats given to each bar. If there are four or eight beats in a bar, we call the T. common T.; if there are three beats, triple T. If the beats are of the value of dotted notes the T. is compound. (See MUSIC for T. signatures.) Formerly triple T. was called perfect T., and was indicated by the signature O for perfection. Common or imperfect T. was indicated by a semicircle, which has now taken the shape of the letter C. For other meanings of T. in music, see TEMPO.

Time. According to Clerk Maxwell, the idea of T. is 'the recognition of an order of sequence in our states of consciousness.' By the exercise of memory, the events in one's experience may be arranged chronologically, and by intercourse with others, and comparison with natural phenomena which recur in a uniform rythmic manner, all events whatever may be systematically arranged according to their place in T. The measurement of T. is involved in the statement of Newton's First Law (see MOTION, LAWS OF). Our ordinary units depend upon the motion of the earth; but it would be possible to get a more general unit, say the T. of vibration of a wave of light of a definite wave length and refrangibility. See SPACE AND T., YEAR, DAY, &c.

Time'-Tables. See BRADSHAW'S RAILWAY GUIDE.

Timo'leon, a famous Greek general, was born of a noble family at Corinth in the beginning of the 4th c. B.C. He saved the life of his brother Timophanes in a battle with the Argeians; but his patriotism was stronger than his personal affections, and when that brother sought to establish a 'tyranny,' T. procured his assassination, 366 B.C. Though this act was generally approved, yet his own remorseful misgivings and his mother's reproaches preyed upon his mind, and for twenty years he lived in close retirement. In 344, when T. was about fifty years old, ambassadors from Syracuse arrived at Corinth imploring aid against Dionysius the younger, who was seeking to recover his authority over their city. T. was made leader of the Corinthian expeditionary force, and by stratagem, diplomacy, bravery, good generalship, and, perhaps most of all, good fortune, ultimately made himself master of Syracuse, repelling the efforts of the Carthaginian allies in a great battle at Crimissus (B.C. 339). In six years he succeeded in clearing Sicily of tyrants, and in establishing free democratic constitutions. His work now done, he resigned his power and lived a private citizen profoundly respected, till his death in 337-336. His brilliant successes, his constant good fortune, and the tragic story of his disinterested sacrifices, make T. a unique figure in ancient history. Plutarch and Cornelius Nepos have written his life. His career has excited less interest in modern times. See *T.'s Rückkehr nach Korinth*, by Conz (Stuttg. 1801), and Arnoldt's *Ueber die Quellen zu T.'s Leben* (Gumb. 1848).

Timor', an island in the Malay Archipelago situated in 9° 10′–10° 25′ S. lat., 124° 25′–127° 10′ E. long., and 300 miles long, with an average breadth of 50 miles. Pop. about 400,000. Though forming one of the Javan chain of islands, it approximates more nearly in soil, climate, and animal life to Australia, from which it is now 300 miles distant, though Mr. A. R. Wallace argues that the strait between the two was at one time only 20 miles wide. T. is traversed by a mountain-chain whose highest summit is Mount Alas (11,800 feet), and average height 6000 feet. T. Peak, near the centre of the island, is a volcano which has been quiescent since 1638. The extremities of the island consist largely of

upraised coral rock. The soil is usually poor and shallow, and the lowlands are very parched and barren during a great part of the year. Trees, mostly of Australian species, grow to a good size, but are nowhere numerous enough to be called a forest. Rice grows well in the swampy coast districts, maize on the dry lowlands, and coffee on the mountain-slopes up to 2000 feet. At an elevation of 3000 to 4000 feet potatoes and wheat do exceedingly well, the wheat in particular being of the finest quality. Sheep thrive on the mountains, and ponies everywhere. The indigenous fauna includes 22 species of mammals and about 200 species of birds, few of which are of gay plumage. Copper, gold, and naphtha are known to exist, but not in remunerative quantities or localities, the great want of the island being roads. The Dutch have settlements at the western end of T., the capital being Koepang, with a mixed population of 3500. It is the residence of a governor, whose jurisdiction extends to the other islands of the chain, as far W. as Sumbawa. The Portuguese own the eastern part of the island. The natives, who are practically almost independent, are of a Papuan type in the mountains, but on the coast there has been a considerable infusion of Malay, Chinese, Portuguese, and probably also Hindu blood. The leading exports are sandalwood, tortoise-shell, bees'-wax, horses, and wheat.

Timor-Laut' ('Timor lying to seaward'), a small group of islands in 6° 40'-8° 23' S. lat., 130° 26'-132° E. long., 260 miles E. of Timor. It consists of eight considerable islands of volcanic formation, and a great number of coral islets. The chief islands are T.-L., Larat, and Tenimber; the first, which is by far the largest, measuring 80 miles by 25. All three are very mountainous. The group lying within the range of the damp S.E. winds which blow through Torres Strait (q. v.), has a much more humid climate than Timor, and luxuriant forests ascend to the very summits of the mountains. The natural wealth of the islands is as yet undeveloped, and tortoise-shell and Bêche-de-Mer (q. v.) are the chief articles of trade. The natives resemble those of north-western New Guinea in appearance, and are fierce and treacherous.

Tim'othy, Epistles to, along with the **Epistle to Titus,** receive the name of the Pastoral Epistles, because they contain instructions regarding the oversight of churches. Until the last half-century they were almost universally acknowledged to have been written, as they profess to have been, by St. Paul, but some recent critics deny their authenticity for various reasons, of which the following are the chief:—1, That the way in which they make Paul act and speak is against it; 2, the manner in which Timothy and Titus are described is suspicious; 3, the general tone and character of the epistles are different from Paul's; 4, unpauline sentiments occur; 5, they exhibit many proofs of a post-apostolic origin; 6, the universality of God's favour expressed is unpauline; 7, numerous passages show the use of Paul's acknowledged writings; 8, Luke is quoted as Scripture (1 Tim. v. 18); 9, the passage 1 Tim. iii. 16 (*God*) is abrupt; 10, there are numerous and striking words and phrases peculiar to those epistles; 11, the language and general structure of periods are different from Paul's; 12, the false teachers spoken of betray a post-apostolic time. Most of these averments are strenuously challenged by conservative critics; some of them, it is urged, cannot be substantiated, others are positively without foundation, and others again are irrelevant.

Tim'othy Grass (*Phleum pratense*) is one of the most valuable of perennial fodder grasses, and particularly on tenacious, strong, and rather moist soils should form a considerable proportion of the seed sown either for alternate husbandry or permanent pasture. It furnishes a full yield in the second year, dries quickly for hay, retains and yields a copious supply of seed, and affords a greater amount of nutriment when its seeds are ripe than it does in the flowering stage. The plant is a native of Europe (common in Britain), W. Asia, and N. Africa. It was introduced into America by Mr. Timothy Hanson, from whom it received its name. Its other name of 'cat's-tail' grass alludes to its cylindrical spike. There are nine other species of *Phleum* (three British), but none are cultivated.

Timur' ('iron'), called also **Timur-Beg** and **Timur-Lenk** from his supposed lameness, and by Western writers from a corruption of the last, **Tamerlane,** was the son of Teragay, chief of the tribe of Barlas, and was born at Kesh, near Samarcand, April 8, 1336. His most illustrious ancestor was Karachar Nevyan, minister of Jagatai, the son of Genghis Khan, but he was connected by the female line with the imperial stem, while his ninth male ancestor was the brother of the fourth ancestor of Genghis. In his twentieth year T. attached himself to the powerful Amir Kurgan, who gave him his grand-daughter in marriage. In 1358 he led a troop of 1000 horse under the Amir against Khorasan, and was left in possession of Herat. The murder of the Amir recalled him to Samarcand, where he was successful in persuading the turbulent chiefs to submit to Tugluk Timur Khan. Left by the latter as his viceroy over the whole country, he strove to reduce the unruly chiefs to submission, but having incurred the suspicions of Tugluk Timur Khan, he was obliged to fly with his brother-in-law, Amir Husain, to the deserts of Khuwarizm or Khiva. Soon, however, with a force of 12 horsemen, which quickly grew to 100, he left the deserts and raised the standard of royalty. In 1362 at the head of 1000 horsemen he entered Sistan, but was severely wounded and obliged to retreat. In the following year his army had grown to 6000 men, and he hastened to give battle to Alyus Khawajah, son of Tugluk Timur, whose army numbered 30,000 horsemen. T. gained a brilliant victory, and drove the invaders out of the country. In 1364 he inflicted upon the Jetes a second terrible defeat, and after defeating and driving from the country his envious brother-in-law Amir Husain, in 1369 settled at Samarcand in an uncontested throne. His first act was to call a *Kurultai*, or general meeting of chiefs, at which he settled the form of government, and rigorously organised his army. His ambition now turned to wider conquests. For some years he confined his operations to incursions into Khuwarizm, but in 1376 he crossed the Jaxartes and established Tokatmish on the throne of Kipchak, and in 1378 he crossed the Oxus and crushed Yusuf, the ruler of Khuwarizm. He next turned to Persia, and reduced the whole country to a province of his empire between 1380 and 1387. In 1390 the rebellion of Tokatmish called him to Kipchak, and after wintering at Tashkend, he crossed the deserts N. of the Caspian Sea, and on May 1391 inflicted a crushing defeat on Tokatmish in N. lat. 53°. In May 1392 he again entered Persia, and during the next five years thoroughly subdued the whole country. In 1393 he crushed Ahmed, Sultan of Bagdad, in 1394 conquered Georgia, and after stamping out a second rebellion of Tokatmish, crossed into Muscovy, and penetrated to the shores of the Dnieper. In 1396 he returned to Samarcand. The next project of his ambitious mind was the conquest of Hindustan, and in March 1398, at the head of 60,000 men, he passed through the defiles of the Hindu Kush, crossed the Indus, and in January 1399 defeated the army of the Sultan of Delhi on the banks of the Jumna. Soon after he took Delhi and Muttra, and gave over their inhabitants to indiscriminate massacre. In April 1399 he returned to his capital, carrying 'spoils beyond measure.' He next overran Syria, took Haleb, Damascus, Aleppo, and Bagdad, signalising his conquests by fearful massacres. At Angora, July 20, 1402, he completely defeated the great Ottoman Sultan Bajazet (q. v.), who was taken prisoner. T. now overran the whole of Asia Minor, and after quelling an insurrection in Persia returned to Samarcand. He now prepared for his long-meditated conquest of China, and in the depth of winter left his capital at the head of his army, crossed the Jaxartes on the ice, but was attacked at Ozar by fever and ague, and died there, February 17, 1405, leaving thirty-six male descendants. A great part of his immense empire was lost soon after his death, but his descendants reigned for a century in Jagatai and Persia, and for 300 years over Northern India, under the name of the Great Moguls. See the Persian history by Sheref-ed-Din-Ali (translated by Pétit de la Croix under the title *Histoire de Timur-Bec, connu sous le nom du Grand Tamerlane*, Par. 1722). A very unfavourable picture is given by the Syrian writer Ahmed ibn Arabshah. See Clavijo, the Ambassador of Henry III. of Castile at the court of T., *Historia del gran Tamerlan, e Itinerario* (translated by C. R. Markham for the Hakluyt Society, 1860); Gibbon's *Decline and Fall of the Roman Empire;* C. R. Markham's *History of Persia* (Lond. 1874); and Howorth's *History of the Mongols* (2 vols. Lond. 1876). Two works are extant, attributed to T.,—the *Institutes*, in Persian (Eng. translation, Oxford 1783), and the *Memoirs*, in the Turki language (Eng. trans. by Major Stewart, 1830).

Tin (*stannum*, symbol *sn*) is a metal belonging to the group which, in combination with oxygen, form acids. T. is a beautiful white metal having an atomic weight equal to 118; its specific gravity is 7·292, and its melting point is 442° F. It forms two series of compounds, dyad as in stannous chloride $SnCl_2$, and tetrad in stannic salts as stannic chloride $SnCl_4$. T. possesses a brilliant metallic lustre, is very malleable, but it is deficient in tenacity. When bent, metallic T. gives out a peculiar crackling sound, and on handling it emits a peculiar smell. When heated in the air a film of oxide forms on its surface, and at a white heat it burns with a brilliant white flame yielding stannous oxide. It is slowly dissolved by dilute hydrochloric acid, but in concentrated acid aided by heat it is rapidly changed into stannous chloride with evolution of hydrogen. Strong nitric acid does not affect the metal, but in a diluted condition the acid attacks it with violence, forming metastannic acid, a hydrated stannous oxide. The alkalies act upon T., at high temperature forming soluble metastannates, and further under the influence of heat it combines readily with chlorine, bromine, sulphur, and phosphorus. T. has a singular tendency to crystallise superficially when acted on by hot dilute aqua regia, a fact taken advantage of to form Moirée Metallique (q. v.). A number of the compounds formed by T. possess considerable economic value. The dioxide SnO_2 combines with water in two modified forms, viz., metastannic acid $H_2Sn_5O_{11}4H_2O$ and stannic acid H_2SnO_3. The former of these is the condition in which the metal is found in its ore tinstone; and, artificially prepared, it constitutes putty powder used for polishing plate, fine metals, and glass; and it produces the opaque glassy compound used as enamels. In combination with sodium, stannic oxide forms 'stannate of soda,' a salt much used in dyeing and calico-printing. A solution of this salt readily tins copper. Stannous chloride $SnCl_2$ in its hydrated form $SnCl_2 2H_2O$ is formed by dissolving T. in hydrochloric acid. It crystallises in the form of prismatic needles, and is a powerful reducing or deoxidising agent. Under the name of T. salts or T. crystals it is in extensive use as a mordant in dyeing and calico printing. Solutions of this salt are known in commerce as single and double muriates of T. according to their strength. Stannic chloride $SnCl_4$, a colourless mobile liquid which gives off dense white fumes, is prepared by passing dry chlorine gas over melted tin, or by treating corrosive sublimate with tin filings. When mixed with water a crystalline hydrate is formed, $SnCl_4 5H_2O$, with great evolution of heat. In its impure state the salt is used by dyers under the name of nitromuriate of T. or 'composition.' 'Pink salts,' also extensively used by dyers, is a double salt of chloride of T. and ammonium, $2H_4NCl, SnCl_4$. Stannic sulphide SnS_2, or Mosaic gold, is prepared by acting on T. filings with ammonium chloride, or mercuric chloride. It is obtained in crystalline scales of a golden yellow colour and a metallic lustre, and is used for imitating gilding and bronzing; but its use is now almost superseded by the employment of bronze powders.

Metallurgy of T.—T. is a metal which has been known and highly valued from very remote times, and in all probability it was used in the alloy bronze for an indefinite period before it was known in its separate condition. It was an important object in the commerce of the ancient Phœnicians, who brought it over both from the E. and from the S. of England; and among the Greeks it was distinguished as *Kassiteros*. From its external resemblance to lead it was termed by the Romans *plumbum album*, lead being called *plumbum nigrum*. For at least 2000 years the S.W. coast of England has been a famous source of T., the principal supplies of the world during that period having been drawn from that region which in consequence was called the Cassiterides or T. Islands, a name which has been erroneously associated with the Scilly Islands.

The only commercial ore of T. is tinstone, an impure dioxide of T.; its other compound, stannine, the sulphide of T., being found in insufficient quantity for use. Tinstone has not been discovered in great abundance in many localities, its sources hitherto having been Cornwall and Devonshire in England, Bohemia and Saxony on the continent of Europe, the islets of Banca and Billeton, and the Straits Settlements in Asia; and recently it has been discovered in great abundance in Tasmania, Queensland, and New South Wales. The tinstone in England is obtained partly as 'stream ore' from the alluvial deposits in valleys and the foreshores of the sea, and partly from lodes in T. mines. Stream T. is obtained in small particles, and is usually remarkably fine, so that certain of the preliminary operations of dressing and calcining necessary for the common ores can be dispensed with. The greater part, however, of the tinstone operated on is associated with various impurities, principally arsenical and sulphurous compounds. The preliminary operations to which T. is subjected are partly mechanical and partly chemical. The ore is first broken into small pieces and pounded very fine in a stamping-mill, and freed from the intermixed earthy gangre and all lighter impurities by repeated washing. It is next placed on the bed of a reverberatory furnace, where it is roasted in contact with air, the charge being frequently stirred to promote the oxidation of the sulphur and arsenical compounds present. Special forms of calcining apparatus, as Brunton's calciner and Oxland & Hocking's calciner, have been devised for effecting this operation. The roasted ore is again washed, whereby the soluble arsenical and sulphurous compounds are separated, and the oxides lighter than the T. oxide are floated away; the residue, consisting of 'black T.,' being ready for the operation of smelting. Two forms of furnace are used for smelting the prepared ore, one being of the ordinary reverberatory type, with a hollow bed, and the other being a shaft furnace on the principle of the blast furnace used for smelting iron, but built only to a height of from 7 to 10 feet. The reverberatory form is now exclusively used in England. The furnace charge is mixed with about one-fifth of its weight of small coal, a small proportion of slaked lime, and some fluor spar, a little common salt being sometimes added. After about five hours' exposure to a sufficient heat, the smelting process is complete; the mass is then rubbed to separate the slag which is drawn out through a special opening, and the metal with some liquid slag is run into one of a pair of basins, where the slag is skimmed off. The smelting T. is still impure, and requires to undergo a process of refining to free it from iron, arsenic, and other contaminations. It is therefore again placed in the reverberatory furnace, which is gradually heated till the pure fusible T. melts, leaving the pure refractory impurities, and the T. run into a basin is kept liquid by the heat of a fire for several hours, during which time it is 'poled' or stirred with a green stick, the dross rising to the surface being meantime skimmed off. Another method of refining is to lift the metal in ladles and pour it back into the basin from some height. When the formation of dross ceases the purified T. is cast into moulds.

T. has hitherto been the most valuable of the non-precious metals, but the abundance of the ore in Australia appears to have made such an impression on the price of the metal that copper and T. are at present about equal in value. In 1872 the average price of T. was £152, 10s., and in 1877 it had fallen to less than one half, £73, 3s. 6d. The quantity of British T. smelted in the former year was 9560 tons, valued at £1,459,990; and in 1877, 9500 tons smelted were valued at £695,162. Further in the year 1877 the imports of T. amounted to 13,762 tons, worth £961,330. The British T. exported in 1877 was equal to 6110 tons, of a value of £449,655; and of foreign T. 3894 tons, valued at £276,592, were sent abroad.

T. is much more extensively used in combination with other metals than in its pure condition; but for various purposes in chemical and pharmaceutical manufactures it is employed on account of not being injuriously acted on as are some other metals. Pipes of block T. are used for conveying water in some cases, but these pipes are more frequently only internally lined with pure T. T. pipes are also used for the worms of distilling apparatus, aerated-water machines, &c. Tinfoil consists either of pure T. or the metal alloyed with a little lead, beaten and rolled into thin sheets, and used for wrapping up food substances, &c. In thicker sheets the same material is used for bottle capsules, &c., and recently a considerable demand has arisen for sheet T. in connection with the phonograph. Tinfoil is also used for silvering mirrors by forming with it a mercuric amalgam. *Pewter* (q. v.) is an alloy of T. and lead in extensive use, and *Britannia Metal* (q. v.) consists principally of T., as does also *Queen's Metal* (q. v.). *Plumber's Solder* is a varying compound of T. and lead. Of greater importance are the alloys of copper and T., comprising *Speculum Metal*, containing 2 parts of copper and one of T., used for the mirrors of reflecting telescopes; *Bell Metal*, containing copper 78 and T. 22; *Gun Metal*, with about 90 copper and 10 T., largely used for machinery bearings, and *Bronze* (q. v.). See TINNING AND TIN-PLATE.

Tin'amou (*Tinamotis*), an aberrant group of *Rasorial* or *Gallinaceous* birds, occurring in S. America. They have a very short, even rudimentary tail. The elegant T. (*T. elegans*), the familiar species, attains the size of a large grouse. The neck is long, and the colour is a greyish buff on the head and neck, the head being crested, while the back is of a buff and blackish brown. The bird feeds on grain-seeds. It is easily captured.

Tin'cal. See BORAX.

Tinc'ture. See HERALDRY.

Tinc'tures are alcoholic solutions of medicines prepared from the crude drug by dissolving non-volatile principles. They are prepared by maceration or displacement, in some of them strong alcohol being used, and in others dilute. The process is described in article *Percolation* (q. v.). Most of the T. are made with proof spirit, which is composed of 5 parts of rectified spirit mixed with 3 parts of water, the resulting compound containing about 47·5 per cent. of water, the specific gravity being ·920. Ether is occasionally used, and ammonia is sometimes conjoined with the spirit, the former compound being called an ethereal tincture and the latter an ammoniated tincture.

Tin'dal, Matthew, one of the English Deists, was born in Devonshire in 1656. He studied at Lincoln and Exeter Colleges, Oxford, graduated B.A. in 1676, and was elected Fellow of All Souls in 1678. In opinions he was first High Church, then Roman Catholic (1685); next Low Church, and finally Rationalist. He died 16th August 1733. T.'s chief work, *Christianity as Old as the Creation, or the Gospel a Republication of the Religion of Nature*, was published anonymously in 1730, when the author was an old man. The argument of the book is that Christianity, as far as it is true, must be the religion of nature; for as God is unchangeable, so is human nature. Thus everything of value in any religious system is already given us outside of that system. T. attacks many of the statements in Scripture, especially those bearing on Jewish history in the ordinary rationalistic manner; but he does not explicitly deny the truth of the Christian revelation, though all his arguments tend to show that it is superfluous. Answers and refutations were numerous. Of T.'s other works the following are the most important:—*Four Discourses of Obedience to the Supreme Powers* (1694); *Rights of the Christian Church Asserted* (1706); *New High Church turned Old Presbyterian* (1709); *A High Church Catechism* (1710). T.'s style is often heavy and confused, but he was a man of learning, candour, and sense. See Lechler's *Geschichte des Englischen Deismus* (Stuttg. 1841); Hunt's *Religious Thought in England* (vol. ii. Lond. 1871); and Stephen's *English Thought* (vol. i. Lond. 1876).

Tin'der, an inflammable substance composed of partially-burned linen, or anything easily kindled. It is used for catching a spark produced by means of a piece of flint and steel. German T. or Amadou is made from several species of fungi (*Polyporus*). The soft tissue is sliced, beaten with mallets, and then dipped in solution of saltpetre.

Tin'ea is the generic term given to parasitic diseases of the skin of vegetable origin, the more important varieties being *T. tonsurans*, *T. decalvens*, *T. favosa*, *T. sycosis*, and *chloasma* or *pityriasis versicolor*. *T. tonsurans* has been described under Ringworm (q. v.). *T. decalvens* may affect the beard, scalp, and eyebrows, and appears as smooth bald patches of a circular form. Its parasitic character is doubted by some authorities, who ascribe it to some inflammatory influence which destroys the hair papillæ; and accordingly the disease is generally classed in this country as *Alopecia* (q. v.). *T. favosa* is described under *Favus* (q. v.), *T. sycosis* under *Sycosis* (q. v.), and *chloasma* under *Pityriasis* (q. v.).

Tin'ea, a genus of moths, including the familiar clothes moths, distinguished by having a rough head, with 5-jointed maxillary palpi and cylindrical labial palpi. The front wings are oblong-ovate and the hind wings ovate and scaly.

Tin'gi, a Brazilian name for the leaves of *Magonia glabrata* and *M. pubescens*, two medium-sized gregarious trees of the natural order *Sapindaceæ* (q. v.). The seeds of the fruit yield a sort of soap. An infusion of the root is used for stupefying fish, and the bark is applied to ulcers and sting-sores.

Tink'ar's Root is the root of *Triosteum perfoliatum*, a shrubby plant belonging to the honeysuckle family. It is a native of rocky woods in the United States from New York to Carolina, where it is called 'fever-root' from its medicinal application, or T. R. from the practitioner who brought it into notice.

Tinnevell'y, the chief town of the district of the same name in the Madras Presidency, British India, 50 miles N. from Cape Comorin, and 513 miles S.W. of Madras by rail; pop. (1871) 21,044. It almost adjoins the military station of Palamcottah. The *district* of T., the most S. in the peninsula, has an area of 5176 sq. miles; pop. (1871) 1,693,959. About 100,000 are native Christians, of whom the Roman Catholics live in fishing villages along the coast, while the Protestants are collected in towns. The crops are rice, cotton, and tobacco; the manufactures, jaggery sugar from the date palm, cotton cloth and muslin. The chief port is Tuticorin. The total exports are valued at £848,000; the imports at £439,000.

Tinn'ing, a process to which many small objects of brass, &c. —notably pins, hooks and eyes, and buttons—are subjected, whereby they receive a very thin coating of tin, which gives them a bright silvery appearance and untarnishable lustre. It is effected by boiling the objects a few minutes with granulated tin in a solution containing 1 part of cream of tartar, 2 of alum, and 2 of common salt in 12 of water. On the withdrawal of the tinned articles, they are dried in revolving barrels containing bran. Copper vessels are tinned by first thoroughly cleaning the surface to be operated on, heating it to a high temperature, while it is preserved from oxidation by a thin coating of rosin and pouring melted tin on it. The tin is uniformly spread over the surface, and the superfluous metal removed by the workman, who uses tow for this purpose. See TIN-PLATE.

Tinn'itus Au'rium is the Latin medical term for 'ringing in the ears.' It may be induced by a full dose of quinine. Nervous deafness is often accompanied by distressing T. A., and in such cases the hydrochlorate of ammonia may be given in full doses. In most cases it is an unimportant symptom, depending on some local temporary cause.

Tin'o, or **Tin'os** (anc. *Tenos*), an island of Greece, nomarchy of the Cyclades, immediately S.E. of Andros. Area, 81 sq. miles; pop. (1870) 11,022. It is 18 miles long by 8 broad, and is traversed by high mountains, the terraced slopes of which yield wine, wheat, melons, figs, &c. Marble, in block or wrought into various kinds of vessels and ornaments, and silk, raw or made into gloves and stockings, are the chief exports. The chief town, T., on the S. coast, is the seat of a Roman Catholic bishop, and has two Roman churches, a small harbour, and a pop. of 2028. To the N. of it is the white marble church of Panagia Evangelistria, a famous resort of pilgrims.

Tin-Plate consists of sheets of fine charcoal iron-coated and partially alloyed with pure tin with the view of preserving the iron from oxidation and giving it a clean, bright, and not easily tarnished surface. As is well known, T.-P. is in most extensive use for common mugs, basins, pitchers, tea and coffee pots, lamps, candlesticks, and for innumerable other purposes; but recently the demand for the preparation has enormously increased owing to the development of the trade in 'tinned' meats, fruits, and provisions of all kinds. In preparing T.-P. the sheets of iron must first be made chemically clean with the most scrupulous care. To secure this they are first pickled in dilute sulphuric acid, then heated to redness in a reverberatory furnace. On cooling they are passed between polished rollers, immersed in a sour mixture of bran and water, from which they are passed into a dilute mixture of sulphuric and hydrochloric acids. Thereafter they are scoured with bran and plunged into either pure water or lime-water. Being now cleaned, they are placed for about an hour in a bath of pure melted tallow, and from that they are passed into the molten tin, the surface of which is kept from oxidation by a thick layer of tallow. After about an hour and a-half they are withdrawn, and the superfluous tin allowed to drain off. They are then once more immersed in a tin bath, and next plunged into hot molten tallow, which carries all the superfluous tin to the lower edge of the plates, after trimming which the plate is finished. Plates coated with a varying alloy of tin and lead are known as Terne plates. These are extensively used for structural purposes, but they cannot be safely employed

in connection with food substances. In 1877 there were 75 T.-P. works in the United Kingdom, the greater part of them being in Wales, the estimated quantity of plates made in that year being 4,049,750 boxes, which would weigh about 197,750 tons. The greater part of the exports of T.-P. go to the United States and Canada.

Tin'tern Abbey, Monmouthshire, standing on the Wye's right bank, 5 miles to the N. of Chepstow, was founded for Cistercian monks in 1131 by Walter, second son of Richard Fitz-Gilbert de Clare. Rebuilt by Roger de Bigod (1269–88), it is an excellent example of the Transition style from Early English to Decorated, the most striking features of its cruciform church (228 by 150 feet) being the central belfry arches, and four great windows with their lacelike tracery. The dismantling of the abbey followed close on the dissolution (1337), when the ruins were granted to the ancestor of the Dukes of Beaufort.

Tintorett'o, Il, one of the greatest painters of the Venetian school, whose real name was Jacopo Robusti, and who received his well-known surname from the fact of his father being a dyer (*Tintore*), was born at Venice in 1512. He studied for a few days under Titian, but deserted the studio of the master for some unknown reason, and subsequently became a devoted student of antique sculpture, of anatomy, and of the works of Michael Angelo. On the walls of his studio he inscribed the ambitious motto, *Il disegno di Michelangelo ed il colori di Tiziano*, and such was the ardour and rapidity of his labour, reflected in the intensity of his style, that he acquired the nickname of Il Furioso. It was admitted by Sebastian del Piombo that T. could paint as much in two days as he could in as many years. The palaces and churches of Venice were rapidly adorned by him with vivid representations of historical, mythological, and scriptural subjects, but only a few of his frescoes survive. The only works said to bear his name are 'The Crucifixion,' in the Scula di San Rocco (engraved by Agostino Caracci), the 'Miracle of the Slave' in the Academy, and the 'Marriage of Cana' in the Church of Santa Maria della Salute. His largest work, 'Paradise,' on the ceiling of the library in the Doge's palace, is 84½ feet by 34, and contains upwards of 100 figures. Other famous works are 'Belshazzer's Feast,' the 'Tiburtine Sibyl,' 'Last Supper,' 'Worship of the Golden Calf,' 'Last Judgment,' and 'Slaughter of the Innocents.' About a third of his works are symbolical, and he frequently makes ingenious use of the winged lion of St. Mark. He certainly belongs to the greatest class of painters in the sense that he is neither ideal nor atrabiliar, but intensely faithful in his treatment of nature. His genuine love of brilliant colour he somewhat sacrificed to an overweening estimate of the value of chiaroscuro, which latterly made him pronounce 'black and white' the finest of all colours. The vehemence of his execution has given rise to the objection that his art lacks refinement, but, as Ruskin remarks, the stroke of T., in the eyes of the ignorant a mere violent dash of colour, is, though the work of an instant, modulated to the utmost degree of delicacy. Daring and passionate in imagination, T. sought to vary by dramatic movement the romantic motives of the Venetian school, and brought to perfection the poetry of chiaroscuro with something of Angelo's sublimity. T. died at Venice, 31st May 1594. His favourite daughter, Marietta, who was an excellent portrait-painter, died in 1590, but his son Domenico, also a painter, lived till 1637. See Crowe and Cavalcaselle, *History of Painting in Italy* (Lond. 1864); and Ruskin, *The Relation between Michael Angelo and Tintoret* (1872).

Tippecanoe', a river of Indiana, U.S., which rises in the T. lake and winds S.W. for 200 miles to the Wabash. At Battle Ground on this river General Harrison defeated the Indians under the 'Prophet,' brother of Tecumseh (5th November 1811).

Tipperah (*Tripura*), the name of a British district and also of a native state in political connection with Bengal, on the N.E. frontier of India. The *district* of T., which lies between the hills and the Meghna river, has an area of 2655 sq. miles; pop. (1872) 1,533,931. It is a flat plain, intersected with numerous water-courses; and produces abundant crops of rice, jute, and betel-nuts. In 1876–77 the registered exports were valued at £606,000, and included rice, jute, and betel-nuts; the imports at £170,000, chiefly piece-goods and salt. There are manufactures of weaving, pottery, and mats. The chief town is Comillah.—The *state* of T., which lies E. among the hills, has an approximate area of 3876 sq. miles; estimated pop. 74,242; revenue, £70,000, inclusive of £51,406 derived from estates in British territory. It is the possession of these estates that decides the succession to the throne. The products are rice, cotton, timber, and elephants. The capital is Agartala. The present Rajah is an enlightened man, an amateur photographer, and a student of physical science. A British political agent has resided at his court since 1871.

Tippera'ry, a county of Ireland, province of Munster, surrounded by King's County, Queen's County, Kilkenny, Waterford, Cork, Limerick, Clare, and Galway. Area 1,061,730 acres; pop. (1871) 216,713. T. lies in the basin of the Suir, which rises in the N. of the county and forms part of the southern boundary before passing through Waterford to the sea. The surface, for the most part level, is diversified by hill-ranges, of which the chief are the Galtees (3015 feet), Knockmeledown (2150 feet), Slievenaman (2364 feet), the Devil's Bit (1600 feet), the Keeper (2278 feet), and Slievenamuck (1215 feet). The Shannon and Lough Derg form part of the western boundary, separating T. from Galway and Clare; and other streams which water it are the Brosna, Nenagh, and Mulkear. There are many small lakes, and among the more fertile districts are the plain of Ormond and Golden Vale. The prevailing rocks are clay, slate, greywacke, sandstone, and limestone; and among the minerals are anthracite, coal, copper, zinc, and lead mixed with silver. The soil, calcareous loam, is in parts singularly productive. In 1876 there were 135,942 acres under crops, 305,758 under grass, 16,363 in woods, and 78,402 in bog, waste, and water. The crops include potatoes, oats, wheat, turnips, and mangel-wurzel. T. had (1876) 13,484 horses, 6938 asses, 132,876 cattle, 127,046 sheep, and 52,929 pigs. In 1874 the valuation amounted to £398,357. Divided for civil purposes into a N. and S. Riding, T. returns two members to Parliament. Clonmel (q. v.) is the chief town. There are numerous antiquities, including the Holy Cross Abbey at Cashel, and Cahir Castle. The Mitchellstown caves, on the border of Cork, are of great extent and contain fine stalactite deposits. The pop. has been reduced, chiefly by emigration, to the extent of 114,854 since 1851.

Tippera'ry (Ir. Gael. *Tiobrad-Arann*, 'the well of the district of Ara'), a market-town in the county of the same name, on the Arra, an affluent of the Suir, 24½ miles N.W. of Clonmel and 110 S.W. of Dublin by the Great Southern and Western railway. Lying at the base of the Slievenamuck mountains, near the centre of the Golden Vale, on the direct road from Clonmel to Limerick, it carries on a considerable trade in butter, corn, flour, &c. The daily butter-market is said to be next in importance to that of Cork. T. is the headquarters of the Union Agricultural Society, and has a spacious corn and provision market, in which markets are held on Thursdays and Saturdays. There is a fine parish church, a Gothic Roman Catholic church with a spire 156 feet high, a Presbyterian church, a Methodist chapel, a town-hall, &c. Pop. (1871) 6084.

Tipp'oo Sul'tan ('tiger-king'), the son of Hyder Ali, and the most inveterate enemy that the English ever encountered in India. Born in 1750, he displayed a predilection for arms from his youth, and during his father's lifetime twice defeated British officers. In 1782 he succeeded to the throne of Mysore. He found himself at the head of a veteran army of 100,000 men, with three millions sterling in his treasury; and he brought to a not inglorious conclusion the war then raging with the British by the treaty of Mangalore in 1783. A second war lasted from 1790 to 1793, and a third broke out in March 1799, partly instigated by French Republican emissaries, who planted a tree of liberty at Seringapatam, and hailed the Sultan as Citizen T. Within two months, T. was driven from the field into his fortress of Seringapatam, which was stormed by the British. T. fell in the assault, and was buried on the 5th of May in his father's mausoleum. T. did not inherit the military and political genius of Hyder, and he appears to have become intoxicated by the exercise of despotic power. He behaved with great cruelty to his prisoners; struck coins with his own name as 'padishah;' and forcibly converted to Islam the Hindu population of the Malabar coast. His favourite plaything—a tiger, in life size, wound up to growl and tear an Englishman—may now be seen in the Indian Museum. See *The History of T. S., written by Mir Hussain Ali Khan* (translated into English by Colonel Miles, Lond. 1844).

Tip'ula. See CRANE-FLY.

Tirabosch'i, Girolamo, a learned Italian writer, was born at Bergamo 28th December 1731. He entered the Society of Jesus, became professor of eloquence in the University of Milan, was appointed in 1770 head librarian to Francis III., Duke of Modena, obtained the title of knight and councillor in 1780, and died at Modena 3d June 1794. His principal work, *Storia della Letteratura Italiana* (Mod. 1772-82, 13 vols.; Rome 1785, 12 vols.; Milan 1822-26, 16 vols.), is one of the great authorities on Italian literature to the close of the 18th c. A French abridgment was published by Landi (Bern 1784, 5 vols.), and a German abridgment by Jagemann (Leip. 1777-81, 6 vols.). He also wrote *Vetera Humiliatorum Monumenta* (Mil. 6 vols. 1793), *Biblioteca Modenese* (6 vols. 1781-86), *Memorie Storiche Modenesi* (6 vols. 1793); and 43 vols. of a *Giornale de' Letterati* appeared under his editorship.

Tirailleurs (Fr.), skirmishers or sharpshooters. The name does not occur in the French army before the year 1792. It was given to certain bodies of French marksmen during the first campaigns of the revolutionary war, whose business was to annoy the front of an advancing or the rear of a retreating enemy.

Tiree' (Gael. *Tir-ith*, 'land of corn'), an island of the Hebrides, 18 miles N.W. of Iona, and 2 S.W. of Coll, is 12 miles long by 4 broad, has a flat surface, but is surrounded by rocky bays. It abounds in game and rabbits, and the caves of the Ceanmharra cliffs are the haunt of myriads of seafowl. The inhabitants, who numbered 2834 in 1871, are engaged in cattle-rearing and fishing. The Duke of Argyll is sole proprietor. Throughout T. are scattered many Scandinavian forts, standing stones, and other remains.

Tire'sias, a celebrated soothsayer, a native of Thebes, who was struck blind either by Athena because he had seen her bathing, or by Hera, through resentment at his having, in a dispute between her and Zeus, decided in favour of the latter. In compensation, however, he was granted the divine gift of prophecy, and his life was prolonged for several generations. In the war of the Seven against Thebes he declared that Thebes would be victorious if Menœceus would sacrifice himself; and during the war of the Epigoni, on the defeat of the Thebans, he advised them to commence negotiations for peace in order to gain time for flight. During the flight T. died, after having drunk from the well of Tilphossa.

Tirhut', a district in N. Behar, Bengal, British India, the largest and most populous in the province. It lies between the Ganges and the Himalayas, and is crossed by many minor rivers. Area, 6343 sq. miles; pop. (1872) 4,384,706. T. is purely agricultural. The crops are rice, barley, Indian corn, and inferior cereals, indigo, opium, and tobacco. The indigo made here is the best in India. There are about 42 concerns, with an annual out-turn of nearly 1000 tons. Saltpetre is manufactured to some extent. A large trade is carried on by boats with Patna, and by land with Nepal. In 1876-77 the registered exports were valued at £1,113,000, including indigo, oilseeds, saltpetre, and tobacco; the imports at £926,000, consisting chiefly of piece-goods, food-grains, and salt. The scarcity of 1873-74 was very severely felt in T. Since 1875 T. has been divided into the two districts of Durbhungah and Muzufferpur.

Tirle'mont (Flem. *Thienen*), a town of Belgium, province of Brabant, on the Great Geete, 12 miles E.S.E. of Louvain by rail. Its church of St. Germain, on an eminence over the town, dates from the 9th c., and contains an altar-piece by Wappes. T. manufactures flannel, woollen hosiery, leather, sugar, and oil, and has a large trade in corn and wool. Pop. (1877) 13,206. It was the scene of a defeat of the Austrians by Dumouriez, March 16, 1793. See Wauters, *L'Histoire des Communes Rurales de T.* (1876).

Tir'nova (Turk. *Turnov*), a fortified town of Bulgaria, on the Jantra, a tributary of the Danube, 35 miles S.S.E. of Sistova and 65 miles N.W. of Jamboli by rail. It stands on a hill 1000 feet high, and is encircled by a wall and trench. Formerly the capital of Bulgaria, it is still the commercial centre of the state, and the converging point of several of the Balkan routes. It is the seat of a bishop, and has several Greek churches, besides mosques, baths, and bazaars. The chief industries are the making of silk and coarse cloth and dyeing. Pop. 13,000. During the Russo-Turkish war the central division of the Russian army, under the Grand Duke Michael, met with no opposition on entering T. (6th July 1877), and there the Czar issued a proclamation to the Bulgarians whom he had come to liberate. T. formed the base of General Gourko while holding the Shipka Pass against Suleiman Pasha, and in the peace negotiations subsequent to the war was made the Bulgarian headquarters by General Todleben. The Assembly of Notables met at T. to elect a prince for the newly-liberated Bulgaria, 2d February 1879. See Kanitz, *Tirnovo's alt-Bulgarische Baudenkmale* (Vienna 1876).

Tir'yns, one of the oldest of the Hellenic cities, noted in the *Iliad* as the 'well walled,' situated in Argolis, in the Peloponnesus, 1½ miles N. of Nauplia, around a rock 50 feet high, on which stood the Acropolis, part of whose 'cyclopean' walls, of huge, irregular, polygonal blocks of stone, is still standing. Excavations were carried on at T. by Schliemann in 1876.

Tisane, or **Ptisan** (Gr. *ptisso*, 'I pound'), is an infusion or decoction, used as a weak diet drink, and is a favourite form for the administration of remedies in the domestic medicine of France.

Tisch'endorf, Lo'begott Friedrich Konstantin von, the great New Testament critic, was born January 18, 1815, at Lengenfeld, in the Saxon Voigtland, Germany. After studying theology and philosophy at Leipzig from 1834, he became a privat-docent there in 1839, and for some years after travelled over a great part of Europe and the East in search of materials for a revision of the text of the New Testament. After his return he was appointed extraordinary professor of theology at Leipzig (1845), and ordinary professor (1859). In 1853 and 1859 he undertook a second and third journey to the East, particularly to Egypt and Sinai, from which he brought back many valuable MSS., including a Greek Bible of the 4th c. He died December 7, 1874. T.'s works chiefly relate to textual criticism of the New Testament; editions of the *Codex Ephraëmi Syri* (Leip. 1843 and 1845), and of the *Codex Friderico-Augustanus* (Leip. 1846), *Monumenta Sacra Inedita* (1846; *nova collectio*, 6 vols. 1855-71), *Evangelium Palatinum Ineditum* (1847), *Codex Amiatinus* (1850 and 1854), *Acta Apostolorum Apocrypha* (1851), *Evangelia Apocrypha* (1853), *Apocalypses Apocryphæ* (1866), *Synopsis Evangelica* (3d ed. 1871), *Codex Claromontanus* (1852), *Fragmenta sacra Palimpsesta* (1854), *Codex Sinaiticus* (4 vols. St. Petersb. 1854; smaller ed. Leip. 1863), *Novum Testamentum Vaticanum* (Leips. 1867). His greatest works are the critical editions of the New Testament (8th ed. 2 vols. 1869-72; smaller ed., half in 1873, the remainder completed by C. R. Gregory, 1877), and of the Septuagint (5th ed. 2 vols. 1875). See Volbeding, *Konstantin T. in seiner 25 jährigen schriftstellerischen Wirksamkeit* (Leip. 1862).

Tiss'ues, the name given to the primary layers of which the bodies of animals and plants are composed. It consists of *cells*, *fibres*, *tubules*, &c., and these are frequently further elaborated and interwoven so as to produce a more complex form of tissue than in other cases. The elementary T. of the human body are represented by (1) *Epithelium* (q. v.), seen in the skin and the lining membrane of the digestive canal; (2) *Areolar*, *Cellular*, or *Connective tissue*, widely distributed in every part of the human frame, and serving to bind together and to consolidate other parts and tissues; (3) *Adipose tissue* or *fat*, composed of large cells, containing oily matter, and serving as a storehouse of combustible matter, a protective layer, and a conservator of heat; (4) *Pigmentary* tissues, seen in the *choroid coat* of the eye, in the *iris*, in the skin, &c; (5) *Cartilage* or *gristle*, of *permanent* nature (as in the *rib-cartilages*) or *temporary* nature, as in the fœtus, where it is destined to become bone; (6) *Bones* and *teeth*, which grow according to the general laws of tissue-growth.

Tiss'ues, Veg'etable. See CELLULAR TISSUE, VASCULAR TISSUE, and VEGETABLE PHYSIOLOGY.

Tit or **Tit'mouse** (*Parus*), a genus of Insessorial birds belonging to the order *Dentirostres*, and forming the type of the family *Paridæ*, in which the bill is straight and short, with the nostrils opening at its base. The wings are of moderate size, and the first 3 quills are graduated. The tail is rounded and even, and the tarsi are scaly in front. The inner toe is short, and the claws curved and strong. In the genus *Parus* itself the nostrils are concealed by the forehead plumes, and the 4th and 5th quills are the longest. The hinder claw and toe are extremely long. The Great T. (*Parus*

major) is a familiar inhabitant of Britain and Europe generally. It attains a length of 6 inches, and is of a purple-black colour on the top of the head and throat, with a spot of pure white on the nape of the neck. The back and shoulders are greenish black, and the under parts are light yellow. The nest is made in holes in walls and in trees. The Blue T. (*P. cæruleus*) is also a familiar British bird, of a bluish-grey colour above, and whitish yellow below; while the red-bellied T. (*P. rubidiventris*) and the yellow-cheeked T. (*P. xanthogenys*) are good examples of other species, the former occurring in S. India and the latter in the N.W. Himalayas. The *Parus caudatus* or long-tailed T. or 'bottle-crested T.' is a familiar British species, and builds a marvellously constructed little nest, of egg-shaped form. The average length is 5½ inches. The crested T. (*P. cristatus*) is of rare occurrence in England, but is common in N. Europe. Its length is 4½ inches, and its colours are black and white boldly disposed. The genus *Paroides* includes the *P. biarmicus* or bearded T., found rarely in England, but common in Holland. The upper parts are pale fawn and grey, while the under parts are white, tinted with yellow. The average length is 6 inches. The marsh T. is a well-known British form. The Cole T. (*Parus ater*), so-named from its dark-coloured plumage, is common in Britain.

Tita'nium (Ti = 50), a metallic element closely allied to tin, is obtained from certain ores, *rutile, anastase, brookite*, &c., in which it occurs in the form of titanic acid (T_2O_4). It is also found in combination with iron in *iron sand, iserine*, or *menachanite*. The acid is extracted by treating the ground mineral with carbonate of potash so that titanate of potash is formed; and this compound is then decomposed by a series of operations, the chief of which is treatment with hydrochloric acid. When pure it is white, but becomes yellow when strongly heated. It is employed in the manufacture of artificial teeth and for tinting glazed porcelain. Passing dry chlorine gas over a heated mixture of titanic acid and charcoal results in the formation of a colourless volatile liquid, tetrachloride of T. ($T_2 Cl_4$), which is very similar to the corresponding tin compound. From this compound metallic T. is obtained in prismatic crystals by passing its vapour over heated sodium. T. has a remarkable affinity for nitrogen; and the violet-coloured nitride (TiN_2) is formed when ammonia gas is passed over red-hot tetanic acid. The terchloride ($TiCl_3$) is obtained in violet crystals, and forms a violet solution in water which resembles stannous chloride as a reducing agent. Lower oxides are believed to exist.

Titanothe'rium, an extinct genus of *Mammalia*, the remains of which occur in Miocene deposits of N. America, and which is included by Marsh in the Ungulate family *Brontotheridæ*. These animals were large, had long skulls, small incisor teeth, and very large horn cores.

Ti'tans, in Greek mythology, were six sons and six daughters of Uranos and Gaia, named Okeanos, Koios, Kreios, Hyperion, Iapetos, and Kronos; Theia, Rhea, Themis, Mnēmosynē, Phoibō, and Tethys. Uranos having banished to Tartarus the Hekatoncheires ('the hundred-handed') and the Cyclōpes, Gaia called the T. to avenge their brothers. They rose and freed them, deposed Uranos, and set Kronos in his place. Kronos and the T. were in their turn put down by the sons of Kronos and Rhea, named the Olympioi, with Zeus at their head, but not till after a long struggle, in which Zeus brought to his aid the Cyclōpes and Hekatoncheires, whom Kronos had again imprisoned in Tartarus. Zeus quelled the T. with the lightning given him by the Cyclōpes, hurled them to Tartarus, placing them under the care of the Hekatoncheires. This struggle, called the *Titanomachia*, was regarded as symbolic of the conflict of reason and order with the rude forces of nature. See Preller, *Griechische Mythologie* (3d ed. by Plew, 2 vols. Berl. 1872–75).

Tithes (Old Eng. *teotha*, a 'tenth' part) are a tenth of the yearly produce of lands, arising from the crops which they bear and the stock which they maintain, and one-tenth of the clear profit of the industry of the people. The origin of T. is to be found in the legal provision made for the Levites in the Mosaic Law (see Levit. xxvii. and Deut. xiv.). The usage passed into the Christian church at an early date, and gradually received the sanction of external law. In England, T. of crops is called *prædial;* as of corn, fruit, &c. T. of stock is called *mixed;* as of wool, lambs, milk, &c. T. of industrial profit is called *personal*. The great T., as of corn and hay, are generally payable to the rector or parson; the small T. to the vicar. Mines and wild animals—deer, &c.—are not tithable, nor are fish taken in the sea or river; but if taken in enclosed water they are liable. Barren ground becomes liable if converted into pasture-land, after seven years from the first attempt to make it productive. Day-labourers are not liable to personal T., and the Queen is exempt by her prerogative. A vicar is not liable for T. to his rector, nor a rector to his vicar. Lands may be exempt from T. by *composition*, or by *custom*, or *prescription*. Composition is by agreement between the owner of the land and the parson or vicar, with consent of the ordinary and his patron, that the land shall for the future be free of T. for a stated equivalent or *Modus* (q. v.). The agreement, to be valid, must be equitable, and the equivalent invariable. A statute of Elizabeth limits the period of composition to twenty-one years, or three lives. A discharge, total or partial, by custom or prescription, is given when lands have been totally or partially exempt from Immemorial Time (q. v.). 6 and 7 Will. IV. c. 71, amended by subsequent statutes, provides for the conversion of all the uncommuted T. in England and Wales into a corn rent-charge, payable in money, according to the value of a fixed quantity of corn, as ascertained from year to year by the average price of corn for the seven years ending at the preceding Christmas. Commissioners are appointed for the purpose—two by a Secretary of State, and one by the Archbishop of Canterbury. Commutation may be (1) by parochial agreement, voluntary on the part of the majority of those having two-thirds of the interest in the land and T. It is binding on the minority unless an appeal be taken, to sustain which sufficient cause of objection must be shown. (2) It may be by compulsory award, which must be effected under the Central Board of Commissioners. 23 and 24 Vict. c. 93 extends the Acts for the Commutation of Tithes.

Ti'thing, a former subdivision, viz. tenth part, of the Hundred (q.v.), occupied by ten householders, each of whom was answerable for the good conduct of the others. Its limits were ordinarily co-extensive with those of a parish, with which it is now practically identical, just as the office of *T.-man* is merged in that of a petty constable.

Titho'nus, in the Greek myth resung by Tennyson, was a son of Laomedōn, who from enamoured Eōs obtained the boon of immortality, cruel because not coupled with immortal youth.

Ti'tian, or **Tizia'no, Vecell'i**, the greatest painter of the Venetian school, was born probably in 1477, of a family of local importance, at Pieve di Cadore, an upland village in the Friulian Alps, 86 miles from Venice. The Piave, flowing to Venice, the swelling outline of Monte Cridola, the 'dawn-coloured' peaks of the dolomites, all entered into the education of the future painter, who was almost the first to appreciate the beauty of landscape. Of T.'s early artistic aspirations very little is told even by way of fable, but at the age of eleven, along with his brother Francesco, he was despatched by his father to Venice, where he studied first under Zuccato, the mosaist, and then under Gentile and Gian Bellini. The influence of Palma and Giorgione is visible in such early works as the wonder-working Christ in the church of San Rocco, and the allegory 'Profane and Sacred Love' (now at Rome), which is characterised by loveliness and simplicity. In 1507–10 T. was employed with Giorgione in covering the Fondaco de' Tedeschi (the 'German cloth warehouse') with frescoes long since destroyed by the sea winds. After painting the famous 'Tribute Money,' he offered and was engaged in 1513 to adorn the Hall of Council with 'The Battle of Cadore,' of which, in addition to descriptions, we have now only a sketch and Fontana's solitary engraving. Meantime T. had been invited to Rome by Leo X., and although preferring to serve 'their sublimity' the Doge and Signori, his profitable dealings so hindered this battle-piece that he was rebuked for negligence in 1518, 1522, and 1537, its completion in the last year being due only to the rivalry of Pordenone. The 'broker's patent' for which he had stipulated he received in 1516; it was worth 100 ducats a year, and involved the duty of painting a portrait of the Doge. As his fame rose, T. became the courtly painter of courts, subservient in choice of theme, devoted equally to Venus and the Virgin, but asserting his independence characteristically in determining his rate of production, and in demanding his pay with pertinacity. Long a favourite at the courts of

Ferrara and Mantua, he was introduced in 1532 by Aretino, his life-long friend, to the Emperor Karl V., who, delighted by his portrait, loaded T. with high-sounding honours, and in 1541 bestowed on him a pension which was little else than a legacy of care. The subsequent events in his life are his triumphal descent on Rome in 1545-46, his visit to the imperial court at Augsburg in 1550-51, and his reception of a new royal patron in Henri III., who visited him in 1574, while returning from Poland to France. In 1523 he had married Cecilia, of whom little more is known than that she died in 1530. The beauty of his daughter Lavinia, and the industry of her artist brother Orazio, consoled T. for the profligacy of Pomponio, his elder son, who became a bishop, and shocked even Aretino by his vices. Wealth, power, and honour had fallen to T. long before he was stricken by the plague, on 27th August 1576. Among his masterpieces are 'Bacchus and Ariadne' (National Gallery), 'Peter Martyr' (destroyed by fire, 1867), 'St. Catharine,' 'Defeat of the Janizaries,' 'St. Sebastian,' 'Annunciation,' 'Christ in the Garden,' 'Medea and Jason,' 'Venus and Adonis,' 'Danäe,' and 'Noli me Tangere.' T. was a master of delicate, powerful portraiture. It was his portrait of Philip II. which won the heart of Mary Tudor. Ruskin ranks him as the principal painter of romantic landscape. The contemporary of Michael Angelo and Raphael, both of whom he long outlived, T. illustrates more perfectly than either the strength and weakness of the Renaissance. He broke completely away from the intensity of Florentine art and the mysticism of the Sienese, and turned to revel in the material grandeur which had reached its height in the pride of Venetian luxury. His style is large and sane, like his nature, and his art 'a golden mean of joy unbroken by brusque movement of the passions.' His was the vigour of exquisitely-balanced faculties; his, above all, the sublime sense of colour and the mastery of pure tints in subtle interplay. Each masterpiece is a chromatic symphony, aglow with the fires of Venetian sunset, luminous with the haze of the lagoons, shot through with 'the inmost purple spirit of light,' radiant with the pearly gleam of flesh, tremulous with silver lights and golden mysteries of shadow. 'There is,' says Ruskin, 'a strange undercurrent of everlasting murmur about his name, which means the deep consent of all great men that he is greater than they . . . that there is a softness more exquisite than Correggio's, a purity loftier than Leonardo's, a force mightier than Rembrandt's, a sanctity more solemn than Raphael's.' A statue of T. was erected at Pieve in 1877. See Gilbert's *Cadore, or T.'s Country* (Lond. 1869); Symonds' *Renaissance* (vol. iii. 1877); and especially *T., his Life and Times*, by Crowe and Cavalcaselle (2 vols. Lond. 1877).

Titica'ca, a remarkable lake, situated in the heart of the Andes, partly in Peru and partly in Bolivia, and 12,545 feet above the sea-level. It lies N.W. and S.E., and is 120 miles in length, with an average width of from 50 to 60 miles. The southern portion, measuring 24 by 21 miles, is almost severed from the main body of the lake by a projecting peninsula. The lake discharges at its S.W. extremity by the Desaguadero (q. v.) into the salt Lake Aullagas, which has no known outlet (see PERU). The E. shore of Lake T. is abrupt and mountainous, but the W. and S.W. shores are low and level, and are skirted by thick beds of tall rushes swarming with waterfowl, and of floating weed, which affords food to cattle when the scanty land-pastures are exhausted. The lake is deep and stormy, so that ice forms near the shores only. It contains a number of strange fishes, and eight species of marine crustaceans, which seem to indicate that it was once at the sea-level. There are eight habitable islands, the largest being T., which gave its name to the lake, and has an area of 20 sq. miles. It was the sacred island of the Incas, who laid it out in terraces planted with consecrated maize and flowers, and irrigated by channels supplied from the royal bath at the top. According to Squier, the name T. probably signifies 'Tiger Rock,' and is due to a fancied resemblance of the rugged crest of the island to a wild cat. The lake is now navigated by steamers, and may be reached by railway from the seaport of Mollendo, 346 miles distant.

Ti'tiens, or **Tiet'jens, Tere'sa**, one of the greatest of operatic singers, was of Hungarian extraction, and was born at Hamburg in 1834. She appeared as *Lucrezia* in her native town in her sixteenth year, and her subsequent engagements at Frankfurt and Vienna had established her position as the chief lyric artist in Germany before her debut in London on April 13, 1858, as 'Valentine' in *The Huguenots*. Her success here was so decided that she made this country her future home, and it was the peculiar scene of her triumphs. She followed Mr. Mapleson's fortunes at the Opera House in the Haymarket and at Drury Lane, and was the sheet-anchor of his management. Nature not only gifted her with a voice of marvellous strength and brilliant quality, but with a dramatic force illumined by the fire of genius. Her physique was imposing, and her style full of stately dignity. Her rare devotion to her art generated the perfection of her vocal method. Upon her alone fell the mantle of Grisi, and her *répertoire* embraced all the grandest tragic rôles in modern opera. As Norma, Donna Anna, Semiramide, Medea, and Leonora, she was unequalled by any of her contemporaries. In the concert-room and in oratorio her success was unequivocal. She died in the full maturity of her powers on October 3, 1877, leaving a blank on the stage well-nigh impossible to fill, while many friends, particularly among the poor and struggling class, mourned the loss of one beloved for her generosity, unselfishness, and warmth of heart. A monument was erected to her memory in All-Souls' Cemetery, Kensal Green, London, November 1878.

Tit'lark and **Tit'ling**. See PIPIT.

Ti'tle, Registra'tion of. See LAND, TRANSFER OF, BY REGISTRATION, LANDED ESTATES COURT.

Ti'tle-Deeds are the written evidences of the ownership to real estate. To pledge them in security of a pecuniary loan may in England create a Mortgage (q. v.). See also LAND, TRANSFER OF, BY REGISTRATION.

Tit'ular, one who possesses the title of an office without the real power or authority belonging to it; *e.g.*, the King of Sardinia was titular King of Jerusalem. Titular dignities of this kind are common in the Roman Catholic Church. Bishops may be nominally appointed over districts in which there are no Christians—*in partibus Infidelium* (q. v.). In English Ecclesiastical law a T. is one who may lawfully enjoy a benefice without performing its duties. In Scotch law the application of the term is different. At the Reformation, the Church lands having become the property of the crown, the king erected them into temporal lordships, the grantees to which were styled *Lords of Erection*, or *Titulars of the Tithes*.

Ti'tus, Epistle to. See TIMOTHY.

Ti'tus, Fla'vius Sabi'nus Vespasia'nus, Roman emperor, elder son of the Emperor Vespasian (q. v.) and Flavia Domatilla, was born December 30, 41 A.D. Brought up along with Britannicus at the imperial court, he early showed great bodily and mental vigour. He saw service first in Germany, and afterwards fought under his father in Britain. T. also accompanied his father in the expedition to Palestine in 67 to crush the rebellion of the Jews, and, on Vespasian's departure for Rome to receive the imperial dignity, was entrusted with the sole conduct of the war, which ended with the capture and destruction of Jerusalem, September 8, 70. After this T. was admitted to a share in the government, and received a triumph along with Vespasian. The licentiousness and cruelty he had previously shown were, on the death of his father in 79, when he became sole Emperor, succeeded by a mildness and clemency that won for him the title of '*amor et deliciæ generis humani.*' His wise beneficence mitigated the disasters of his reign—the eruption of Vesuvius, 24th August 79, which buried Herculaneum and Pompeii, a destructive plague, and a three days' and three nights' conflagration in Rome (80). The ruins of the public baths built by T. still exist. He died 13th September 81, after a reign of 2 years, 2 months, and 20 days, and was succeeded by his brother Domitian. See Beulé, *T. et sa Dynastie.*

Tiumen', a town of W. Siberia, at the confluence of the Tjumenka with the Tura, a tributary of the Tobol, 138 miles S.W. of Tobolsk. It is regularly built (chiefly of wood), has 10 stone churches, a mosque, &c. There are manufactures of soap, tallow candles, and textile fabrics, bell and iron foundries, potteries, and shoemaking. T. is also a great centre of transit traffic—boats coming here from the Obi, Irtish, Tobol, and Tura, and unshipping goods for the W. and S. T. is the projected starting-point of the Central-Asian Railway. A great market is held here in January. Pop. (1867) 15,572.

Tiv'erton, a town of N. Devon, 18 miles N. of Exeter by rail, stands on the slope of a hill above the confluence of the Exe and Loman, from whose two fords it derives its Old English name of *Twy-ford-ton.* The chief of its three churches, St. Peter's (136 feet long by 82 feet wide, with a tower 110 feet high), dates from 1073, but was partly rebuilt in the 16th, and has been thoroughly restored in the present century. Other edifices are the town-hall (1864), in late Venetian style, with a tower of 80 feet, a market-house (1830), and the grammar school ('free' in name but not in fact), which, founded by Peter Blundel in 1604, and familiar to every reader of Blackmore's *Lorna Doone*, is now (1879) about to give place to a modern structure. The historic building, however, will remain intact. The cloth trade has declined since the 17th c., and lace-making (employing 358 adults in 1871) is now the leading industry. T. returns two members to Parliament, and publishes two weekly newspapers. Tuesday is the market-day. Pop. (1871) 10,024.

Tiv'oli (anc. *Tibur*), an old Roman town in Italy, province of Rome, beautifully situated on the left bank of the Teverone, 17 miles E.N.E. of Rome. It is interesting from the number of antiquities it contains, the most remarkable of which are the remains of the temples of Vesta and the Sibyl, and the villas of Mæcenas and Hadrian. Near the town is the Villa d'Este, erected in 1549. In 1826 a serious inundation destroyed many houses, and in consequence a new channel was formed for a part of the waters of the river, by the construction of two shafts through the limestone-rock of Monte Catillo, 870 feet and 990 feet long respectively. In 1834 this new channel was opened by Folchi in the presence of Pope Gregory XVI., and a new waterfall was thus formed 330 feet high. Pop. (1874) 8105.

Tlemcen', a town in Algeria, 88 miles S.W. of Oran (q. v.), with which it is connected by railway. It occupies the site of the Roman city of *Pomaria*, and under the Moors, in the 12th and 13th centuries, was a place of great importance, with a pop. of nearly 150,000. It stands on the northern slope of a steep mountain, at a height of 2500 feet, in the midst of a well-irrigated and richly-cultivated country, which especially abounds in fruit-trees. The chief exports are olive-oil, dried fruit, corn, wool, sheep and cattle, dressed alfa cloths, carpets, and leather goods. It has 23 mosques, two of which are fine specimens of Moorish architecture. Pop. 16,722. See Schneider and Hans, *Von Algier nach Oran und T.* (Dresd. 1878).

Toad (*Bufo*), a genus of Amphibian Vertebrata, belonging to the order *Anoura*, in which there is no tail. Strictly speaking, however, the tail, which exists in the tadpole or larva only, disappears on the attainment of adult life. In the T. (which forms a special family, that of the *Bufonidæ*), the tongue, as in the Frog (q. v.), is fixed to the front of the lower jaw, but is free and bifid posteriorly. There are no teeth in either jaw. One foreign genus of toads (*Rhinophrynus*), however, has a tongue which is free in front. The hind limbs are not so disproportionate as in the frog, and the hind toes are only partially webbed. The skin is glandular and warty. Contrary to the general belief, no poison apparatus exists in the T. An acrid secretion is given off from the skin, but it is not poisonous. The habits of the T. resemble those of the frog, but it is by no means so lively as the latter, and appears to prefer dark and shady resorts. The food consists of insects, slugs, and like fare. The common T. (*Bufo vulgaris*) attains a length of 3 or 4 inches. It is of a dark olive-green colour, and deposits its spawn in water in March and April. The Natterjack T. (*B. calamita*) is a second species, found in England and in the S.W. of Ireland. Its colour is a yellowish brown, and a bright yellow line marks the spine. It is said to exude a powerful and disagreeable odour. Among other toads, the Surinam T. (*Pipa Americana*) is a familiar species (see PIPA). The green T. (*B. viridis*) occurs in the S. of France; the *B. tuberosus*, or warty T. of Fernando Po, is a well-known form. The *B. agua* of S. America resides in holes which the creature excavates. The T. is extremely tenacious of life, but experiments by Buckland, Edwards, and others have conclusively shown that there is no truth in the oft-repeated stories of the creature being able to support life when enclosed in solid rock for immense periods of time.

Toad'flax (*Linaria*, the leaves of some species resembling those of the *linum* or flax) is a genus of herbs of the natural order *Scrophulariaceæ*, closely allied to *Antirrhinum* or Snapdragon (q. v.), from which it is distinguished by the corolla being spurred, and the capsule openings being somewhat different. There are about 100 species, natives of Europe, W. Asia, and N. Africa, some of which occur in other countries as introduced weeds. Of the British representatives, *L. vulgare* is the only one generally common. It is easily recognised as a stout, erect, glabrous perennial, with crowded linear-lanceolate leaves and a dense raceme of yellow flowers peering through hedge-bank vegetation on a gravelly soil. It is purgative and diuretic. Three other species are cornfield weeds. *L. Cymbalaria*—the ivy-leaved T.—found on old walls, &c., in many parts of the kingdom, is a native of S. Europe, where it is used as a salad herb. *L. speciosa* is a border annual in gardens.

Toad'stone, a local name applied to the igneous rocks of various descriptions which intersect and are interbedded with the strata of Carboniferous formation in Derbyshire.

Toast. See DRINKING USAGES.

Tobacc'o (according to Humboldt, the native Haytian designation for the pipe used in smoking) is a genus of *Solanaceæ*, natives of America, Eastern Asia, and Australia. Its botanical name is *Nicotiana*, given in commemoration of Nicot, who was the means of introducing the plant into France. The genus consists of sticky-leaved herbaceous plants, with a tubular, bell-shaped, five-cleft calyx; a funnel-shaped five-lobed corolla, having five stamens inserted within the tube; a two-celled ovary surmounted by a simple style; and a two-valved capsule with numerous seeds. The best-known species is *N. tabacum*, a handsome plant of 3-6 feet high, with large oblong lance-shaped leaves and pretty rose or pink flowers. It is extensively cultivated both in the New and the Old World, recent botanical investigation proving that not only is the American and Cuban crop procured from it, but also that it is the source of Latakia T. and of that known as Manilla. Although *N. tabacum* is shown to yield the bulk of the commercial T., other species likewise produce a serviceable article, as *N. Persica*, *N. rustica*, *N. repanda*, *N. multivalvis*, *N. quadrivalvis*, and *N. latissima*. Columbus, when exploring Cuba in 1492, was the first who noted the Indian custom of T.-smoking, and about a century later T. was brought to England by Sir Ralph Lane. Sir Walter Raleigh is credited with introducing T.-smoking into England—a fashion that made rapid progress, there being in 1614 upwards of 7000 T.-shops in and around London. But the smoker was not allowed his enjoyment unmolested either in this country or in other parts of Europe, both Christian and heathen rulers combining to crush the custom. James I. not only tried to suppress it by proclamations, but he raised the duty from 2d. to 6s. 10d. per lb. In defiance of all legislative measures its use increased among all classes, and spread with great rapidity to the various countries of Asia, so that at the present time it is estimated that the annual production of T. throughout the world amounts to more than two millions of tons. Prohibitory laws prevent its cultivation in the United Kingdom.

The cultivation of T. is conducted on a much more extensive scale in the United States than in any other country in the world, the most important centres of the industry being Virginia and Kentucky. Although Kentucky is now by far the largest producer, Virginia was the first state to be specially identified with T.; and the T. trade of that state about the middle of last century laid the foundation of many great fortunes, and gave the first great impetus to the commercial prosperity of the city of Glasgow whose 'Virginia dons' or 'T. lords' were her earliest merchant princes. The following is an outline of T. cultivation and curing as conducted in these states:—The variety of the plant chiefly grown attains a height of from 5 to 6 feet, with large broad leaves which may attain a length of 2 feet. The seeds are first sown in a warm sheltered plant-bed, from which, after the young plants have attained a height of 6 or 8 inches, they are transplanted. In the field the plants are placed in rows 4 feet apart and 3 feet between each, and the earth is heaped up around each plant. After some time they have to undergo the process of 'worming,' a searching for and destroying a T. worm which infests the plantations. Then comes the operation of 'pruning,' or removing such small lower leaves as touch the ground. These leaves are sometimes collected, cured, and sold as 'prunings.' When the plants are at the point of flowering they are subjected to 'topping,' or breaking off of the top of the

stem, whereby the sap which would have gone to flowers and seed is diverted to stem and leaves. 'Sackering' is an analogous operation, consisting in the removal of lateral or axillary buds which readily appear after the removal of the tops. The crop ripens towards the end of September, and the plants are cut down near the ground, the stems split, and by means of the split hung up on sticks in sheds to dry. A fire is lighted in the centre of the shed and kept up for four or five weeks, when it is sufficiently dry. Then ensues the operation of 'stripping,' or removing the leaves from the stem and assorting them into small bundles of different qualities called hands, each containing 5 or 6 ounces. In this state it constitutes dry T., and as such is generally sold by the cultivator; but it does not yet possess the properties or aroma ultimately developed in it. To develop its aroma it is subjected to bulking, which consists in piling up a large circular heap and covering it over with heavy woollen cloths, when it undergoes a sweating or incipient fermentation by which its odour is brought out. T. is a highly exhaustive crop, and various districts with various soils produce very different sorts as far as flavour is concerned. In the trade a great number of varieties are recognised, mostly distinguished by the names of the countries from which they are derived. The principal other manufactured forms known to the public are *bird's-eye*, which is the cut leaf with its stalk (in other kinds the stalk being removed); *shag*, from dark Virginia leaves; *canaster*, coarsely cut Ohio and German leaves; *returns*, a mixture of the cuttings of all kinds. Of roll and cake T. the principal kinds are *pigtail*, *negro-head*, and *cavendish*. The varieties of *cigars* and *cheroots* are innumerable. In *snuffs* the *high-dried* is from the leaf roasted before grinding, the *rappee* from the moist leaf.

According to the agricultural statistics of the United States in 1876, 550,000 acres were devoted to T., the crop from which amounted to 172,000 tons, the yield per acre being thus upwards of 600 lbs. In several states, including New Hampshire and Pennsylvania, the yield is as high as 1600 lbs. to the acre. For the principal European countries the following table exhibits the most recent returns:—

Country.	Acres.	Tons.	Value.
Germany	54,00	31,700	£653,000
Austro-Hungary		62,300	
France	32,000	14,000	480,000
Russia (estimate)	100,000	50,000	
Turkey with Asia Minor and Danubian States (estimate)		31,000	
Holland		6,000	
Belgium		2,000	
Italy		4,500	96,000

T. is also grown to a limited extent in Greece, Sweden, and in Spain. The Spaniards in their colonies have always possessed a monopoly of the finest T. grown in the world. The annual produce of Cuba is stated at 15,000 tons, one-third of which is grown in the celebrated Vuelta Abajo district, from which only real Havana cigars are made. Scarcely less famous is the T. of the Philippine Islands, whence Manilla cheroots are made. Of that T. the Spanish government sells to the value of about £1,600,000 annually. The Dutch also cultivate a very superior class of T. in their East Indian possessions, which is brought to Europe to the extent of 12,000 tons annually; and in Jamaica a variety of T. is now being produced whence cigars in no way inferior to the finest Havanas are made. Throughout S. America, in India, China, and Japan, T. is extensively prepared for local use; but recently Indian T. has been sent to the European market with hopeful prospects.

In Austro-Hungary, France, Italy, Spain, and Portugal, the manufacture of T. is a government monopoly, and in Great Britain, Russia, and Turkey the manufacture is conducted under state surveillance. The following statement shows approximately the consumption per head in several of the principal smoking countries:—

Germany	4·00 lbs.	Hungary	1·91 lbs.
United States	3·52 ,,	Italy	1·55 ,,
Austria	3·25 ,,	United Kingdom	1·45 ,,
France	1·96 ,,	Russia	1·32 ,,

From returns issued by the Board of Inland Revenue, we gather that the quantity of T. cleared from bond for consumption in the United Kingdom has nearly doubled in forty years. Whereas in 1841 the quantity was under 14 oz. per head of population, in 1851 it amounted to 1 lb. ¼ oz.; in 1861, 1 lb. 3¾ oz.; in 1871, 1 lb. 5½ oz., and in 1876, 1 lb. 7½ oz.

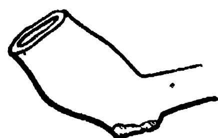
T. is used either for smoking, chewing, or as prepared powder for snuffing; but the dirty habit of chewing is not very prevalent, and snuff-taking is now much less common than formerly. Smoking, however, is decidedly on the increase.

Physiological and Medicinal Properties of T.—When T. is taken in a large dose, either in the form of powder or infusion, the following effects are produced, according to Dr. Taylor:—'The symptoms are faintness, nausea, vomiting, giddiness, delirium, loss of power in the limbs, general relaxation of the muscular system, trembling, complete prostration of strength, coldness of the surface with cold clammy perspiration, convulsive movements, paralysis, and death. In some cases there is purging, with violent pain in the abdomen; in others there is rather a sense of sinking or depression in the region of the heart, passing into syncope, or creating a feeling of impending dissolution. With the above-mentioned symptoms there is dilatation of the pupils, dimness of sight, with confusion of ideas; a small, weak, and scarcely perceptible pulse, and difficulty of breathing." These physiological effects may be produced by taking T. internally, by applying it to an open surface, as an ulcer, or by applying the leaves to the skin. There is reason to suppose that T.-juice is frequently used by criminals to drug porter and other liquids, so as to render their victims more helpless. The following analysis of T. *smoke* is given by Dr. Richardson, who has very fully investigated the subject of T.-smoking. Firstly, there is in all T. smoke a certain amount of *watery vapour*, impregnated with various substances from which it may be separated. Secondly, a small quantity of free *carbon* is always present, and it is to the presence of this constituent that the blue colour of the smoke is due. Thirdly, there is a certain quantity of *ammonia* present. Fourthly, *carbonic acid* is always present. Fifthly, T. smoke yields a *product having an oily appearance*, and possessing poisonous properties, which contains three substances, viz., a fluid alkaloid, *nicotine*, a volatile substance having an empyreumatic odour, and an extract of a dark resinous character, having a bitter taste. The carbon, in the case of inveterate smokers, settles on the back part of the throat and on the lining membrane of the bronchial tubes. The ammonia excites the salivary glands, and is supposed to exert a certain influence on the blood; and the carbonic acid may have some influence in producing the languor which accompanies and follows smoking. The empyreumatic substance gives the peculiar smell, and the resinous extract the bitter taste, but the peculiar physiological effects are due to the nicotine. According to Richardson, T.-smoking may produce various functional disturbances: (1) on the *stomach*, causing indigestion. (2) On the *heart*, producing debility and irregular action. (3) On the *organs of the senses*, as dilatation of the pupil, confusion of vision, subjective sounds &c. (4) On the *brain*, suspending the waste of that organ, and oppressing it if it be duly nourished, but soothing it if it be exhausted. (5) On the *nerves*, leading to over-secretion of the glands which they control. (6) On the *mucous membrane of the mouth*, giving rise to smoker's sore-throat. (7) On the bronchial surface of the lungs, sustaining any irritation that may be present, and increasing the cough. (8) T. possesses the power of arresting oxidation of the living tissues, and thus checking their disintegration. 'Before the full maturity of the system is attained, even the smallest amount of smoking is hurtful; subsequently the habit is, in most instances, only prejudicial when carried to excess. It is innocuous as compared with alcohol; it does infinitely less harm than opium; it is in no sense worse than tea; and by the side of high living, altogether, it contrasts most favourably.'

Law of the United Kingdom regarding T.—The culture of T. is prohibited in the United Kingdom, under a penalty of £10, except in a medicinal garden, to the extent of half a pole. Any one having T. so produced is liable to a penalty of £100. Adulteration renders the offender liable to six months' imprisonment, or to a fine of £100. The latter penalty is also attached to cutting leaves in imitation of T. The removal of over 4 lbs. of it, or of snuff above 2 lbs., without a permit, is prohibited under penalty of forfeiture. See Tiedemann, *Geschichte des Tabaks* (Frankf. 1854); *Bibra, Die Narkotischen Genussmittel* (Nürnb. 1855); Fairholt, *T., its History and Associations* (Lond. 1875); and the *Tabakszeitung*, published at Berlin since 1868. Mr.

Arnold is (1879) preparing a catalogue of his unique collection of 500 works on T., its uses, cultivation, manufacture, &c.

Tobacco-Pipe, an implement consisting essentially of a bowl or holder for tobacco, and a stem through which the tobacco smoke is drawn into the mouth. It is in almost universal use, but in form and material it varies much in different countries. Clay, meerschaum, wood, stone, metal, horn, ivory, and amber, are all employed for making pipes in whole or in part. Pipes having long thin stems, straight, bent, or twisted, of white plastic clay, are manufactured in England, Belgium, and Holland; Germany makes them of porcelain; meerschaum and amber pipes come chiefly from Ruhla, Vienna, and Paris, while the 'briar-root' is a specialty of St. Claude in France. (The name 'briar' is a corruption of *bruyère*, a shrub the root of which is gathered extensively in S. France for the pipe manufacture). Turkey and Algeria produce red clay bowls, having flaring mouths, with cherry or jasmine wood for the stems and amber for the mouth-pieces. Pipe-sticks of wild cherry are largely prepared in Germany. The Lapp smokes an iron pipe, and the Ural Cossack a graphite one, while the Samoyede uses a walrus tooth, and the Hottentot a bull's horn for a pipe-bowl. A *chibouk* of Siout clay is smoked in Egypt, and the elegant *hookah* or *narghilhé* in India, Persia, &c. (see NARGHILEH). The primitive form of the hookah—a cocoa-nut containing water and provided with two tubes—is still in use among the Hindus and Tibetans. The calumet, or 'pipe of peace' of the N. American Indians, has a carved bowl of red 'pipe-stone' obtained from a quarry of the Coteau des Prairies, Dakota Territory, while the 'war-pipe of these tribes is the Tomahawk (q. v.). The T.-P. is believed to have been invented in N. America, primitive examples, chiefly in stone, and wrought in fanciful forms, having been excavated from the 'grave-mounds' of Ohio, Mexico, and Central America. Smoking was first practised in England in the 16th c., when, according to Aubrey, the rich used silver pipes, and the poor a walnut-shell and straw. Harrison, in his unpublished *Chronologie*, observes under 1573: 'In these daies the taking in of the smoke of the Indian herb called *Tabaco* by an instrument like a litle ladell . . . is gretly taken up and used in England against Rewmes.' Clay pipes must soon have become common, for their manufacture was an important industry in 1619, from which year dates the incorporation of the craft of T.-P. makers. Early clay pipes had a very small bowl, thick stem, and broad spur, on which the pipe rested unsupported. A specimen of the time of Cromwell, found in Bruntsfield Links, Edinburgh, is shown (half the actual size) in the accompanying figure. Broseley, in Salop, has been a noted seat of the clay T.-P. manufacture since the 17th c. The pipes are made by hand by the following operations:—A piece of moist Pipe-Clay (q. v.) is rolled out into a slender cylinder to form the stem of the pipe, and a lump is left at one end to make the bowl. The stem is bored by driving an oiled iron wire through its axis, after which the clay with the wire still in it is introduced into a folding metal mould, the two sections of which are then brought closely together in a clamp or vice. The pipe-stem being thus formed, a 'stopper' fixed to a lever arm is inserted in the head of the mould, and so squeezes the clay into the form of a bowl. The superfluous clay is next cut away, the wire is withdrawn, and the pipe is taken from the mould, trimmed, and after drying for a day or two is fired in a kiln in which 50 gross of pipes may be fired in eight or nine hours. Lately an ingenious machine for making clay pipes was devised by Mr. Robert Rankin, and made by Messrs. Steven and Struthers, Glasgow, which promises from its productive power to revolutionise the manual industry. Hand-made clay pipes cost 7½d. per gross, or £11 for 480 gross; Rankin's machine turns out the latter quantity at a cost of £2.



Tobacco Pipe—17th c.

Toba'go, a British island in the W. Indies, one of the Windwards, 60 miles S.E. of Granada and 18 N.E. of Trinidad, has an area of 114 sq. miles, and a pop. (1876) of 17,881, an increase since 1861 of 2471. It is 32 miles long by 9 broad, and is traversed by a mountain range which attains a height of 1800 feet. The hills, which are in great part covered with primitive forests, present steep cliffs to the sea, but in other places open upon littoral plains in well-watered valleys. The climate ranges from 75 to 90, and the products comprise pimento, sugar, cocoa-nuts, cotton, coffee, indigo, &c. In 1876 the value of exports (chiefly sugar, rum, and molasses) was £79,670, and of imports £54,582, while the burthen of ships entering and clearing the ports was 26,553 tons. Scarborough, the chief town, lies on Rochley Bay, at the base of a conical hill, 422 feet high, and crowned by Fort King George. Plymouth, on the lee-shore opposite, is the landing-place for the royal mail-steamers. T. was discovered in 1498 by Columbus, who named it Assumption. Its present name is said to have arisen from the fact that early European visitors found the native Caribs addicted to the use of *tobacco*. T. became British in 1764, and is administered by a lieutenant-governor under the governor of Barbadoes.

Tobermo'ry (Gael. 'the well of our Lady St. Mary'), a small town in the island of Mull, Argyllshire, on T. bay in Mull Sound, 30 miles N.W. of Oban. It was founded in 1788 by the British Fishery Company, and has a small but safe harbour with two quays. A new Free Church, in Old English style, was opened January 1879. Pop. (1871) 1344.

To'bit, Book of, is one of the apocryphal books of the Old Testament. There are three theories regarding it:—(1) that it records actual history, which was universally believed up to the time of the Reformation, and is held by some scholars even yet; (2) that it is a moral fiction, an opinion which was first started by Luther; and (3) that it is based upon a real occurrence, preserved by tradition but poetically embellished. The religious character of the book is interesting and important, as showing the phases of faith which prevailed before the time of Christ. Those who believe the book to be genuine history necessarily hold also that Tobit himself was the author of it, since in the first three chapters he speaks in the first person (*cf.* also xii. 20, and xiii. 1). According to this theory it must have been written about 600 B.C. (*cf.* T. i. 15). By modern critics, however, it has been placed as late as 350, 300, or 200 B.C., and even 10, 100, and 130 A.D. There is no dispute as to its having been originally written in Hebrew and Aramaic, from which it was translated into Greek; the LXX. being the oldest extant version of it. See A. Neubauer, *The Book of T.* (Lond. 1878).

Tobolsk', a Russian government of Siberia, bounded W. by European Russia, N. by the Arctic Ocean, E. by the governments of Yeniseisk and Tomsk, and S. by the Kirghiz steppes. Area 531,963 sq. miles; pop. (1873) 1,086,848 (nine-tenths Russians, the rest Tartars, Ostiaks, and Samoyedes). The W. and S. is covered with spurs of the Ural and Altai mountains, from which the land slopes towards the Arctic Ocean in an extensive plain, of which the northern portion, between N. lat. 66° and the ocean, is a frozen swamp for nine months of the year; the middle, between N. lat. 58° and 66°, a forest region with a mild climate, inhabited by hunters and producing fur; and the southern, an agricultural tract with a warm climate, producing the cereals and the fruits of Central Europe. The chief river is the Obi, with its feeders the Tobol and Irtish. Agriculture and cattle-rearing in the S., the collecting of furs in the middle, fishing in the N., besides manufactures in several of the towns, and mining in the district next the Ural Mountains, occupy the people. There is a large transit trade with Russia. Recent exploration voyages by Captain Wiggins of Sunderland have proved the practicability of opening up direct communication by sea with the rivers Obi and Yenesei. The former of these rivers promises to become a permanent channel for the exportation of the corn of T., which can be sold in the English markets cheaper than American corn.—**T.**, capital of the preceding government, at the junction of the Tobol and the Irtish, is 298 miles E. of Ekaterinburg. It was founded in 1590, and is the seat of the general governor and the highest courts of W. Siberia. It has a theological and a normal seminary, a gymnasium, a military school, an arsenal, theatre, and penitentiary. Pop. (1872) 17,427.

Tocantins', a large river of Brazil, rises in the province of Goyaz, and after a northerly course of 1640 miles falls into the river Para (q. v.), the southern arm of the estuary of the Amazon. The chief affluent of the T. is the Araguaya, which joins it in 6° S. lat., and is there as large as the T. itself. Both rivers are navigated by steamers, the T. for 820 and the Araguaya for 943 miles, but the former is much impeded by falls, rapids, and sandbanks. At its mouth the T. is 8 miles wide.

Tocque'ville, Alexis Charles Henri Maurice Clérel de, the eminent French politician and political writer, was born at Verneuil, July 29, 1805. His father was Hervé Louis François Joseph Bonaventure Clerel, Comte de T. (1772–1856), peer of France, politician and historian, and a writer of some merit. T. studied philology at Metz and law at Paris (1823–26). In 1827 he was appointed *juge auditeur* of the tribunal of Versailles. In 1831–32 he was sent by the French government, along with his friend M. de Beaumont, to the United States to inspect and report on the American prison system. They published a joint work on their return, entitled *Du Système Pénitentiaire aux États-Unis et de son Application en France* (Par. 1832; 3d ed. 1845). This treatise, which was crowned by the Academy, recommends the solitary confinement of prisoners. In 1832 T. resigned his office under government, and, after a brief visit to England, gave himself up to the composition of the first of his two great works, *La Democratie en Amérique* (1835–40, 15th ed. 1868; Eng. trans. 4 vols. Lond. 1838). This work is in reality a treatise on the general principles which ought to be taken as the rule of action by all democratic governments. These are, in brief—(1) full extent of individual liberty with all its concomitants (as freedom of the press, &c.); (2) careful avoidance of centralisation. The bearing of this on French politics is obvious. This work was received with the favour it deserved; the Academy awarded to it a special prize of 8000 francs, and a quick succession of honours was bestowed on the author. In 1837 he was appointed chevalier of the Legion of Honour; in 1839 he was chosen by the electors of Valagnes as their representative; and in 1841 he was elected member of the Academy. For some years practical politics occupied all his attention. In 1849 he entered the Odilon Barrot Cabinet as minister of foreign affairs, but the *coup d'état* of 2d December—to which, as may be imagined, he was strongly opposed—drove him from office. He then occupied himself with *L'Ancien Régime et la Révolution* (Par. 1856, 7th ed. 1866; Eng. trans., *France Before the Revolution*, Lond. 1856). This is his greatest work. It was meant to be an exposition of the manner in which the post-revolution France grew out of the pre-revolution France. From a review of the previous state of things it was conclusively proved that the outburst was not, and could not be, caused by any party or sect; on the contrary, it was an absolutely necessary resultant of the pre-existing causes. This work, powerful as it is, was but a fragment of the original design. T. intended to follow it up by others dealing with the great events in the later history of France. He was engaged at these when he died at Cannes, April 16, 1859. Besides the works mentioned above, T. wrote *État Social et Politique de la France* (trans. by J. S. Mill, in *Westminster Review*, 1836), *Le Droit au Travail* (Par. 1848), and a number of reports and papers on prison reform and general, social, and political subjects. All the works of T. are written in a calm, dignified, and powerful style. An ardent lover of liberty, he is yet fair to all sides. His facts are unimpeachable, and the conclusions he draws are invariably logical. No more luminous, severe, dispassionate intellect ever applied itself to politics. It is hardly extravagant to call him the greatest political thinker of his day in France, perhaps even in Europe. His *Œuvres Complètes* (9 vols. Par. 1860–65) were edited by his friend M. de Beaumont, who also edited his *Correspondance* (Par. 1860; Eng. trans. Lond. and New York 1861), to which he prefixed a biographical memoir.

Tod, a now disused weight for measuring wool, which contained 28 lbs. avoirdupois.

To'das or **Torowars'** (a Tamil name for herdsmen), a curious aboriginal tribe confined to the Neilgherry Hills in S. India, where they have attracted much attention. They are a well-built race, and, though only numbering 683 souls (1871), exercise a supremacy over the other hill people. Their sole occupation is the herding of buffaloes, from whose milk they make excellent *ghee*. They wear little else than cotton blankets, and abundant silver ornaments. Their dwelling-places are thatched huts, resembling the tilt of a waggon. Their language is a peculiar branch of the Dravidian Stock (q. v.). See *Primitive Tribes of the Nelagiris*, by J. W. Breeks (Lond., India Museum, 1873).

Todd, Henry John, D.D., an industrious English author, born in 1763, studied at Hertford College, Oxford, where he graduated (1786), took orders, and became successively vicar of Milton, near Canterbury (1792), rector of All Hallows, Lombard Street, London, and keeper of the MSS. at Lambeth Palace, and rector of Settrington, Yorkshire (1820), where he died, 24th December 1845. Among his voluminous works the most valuable are his elaborately annotated editions of Milton and Spenser, his *Illustrations of the Lives and Writings of Gower and Chaucer*, and his expanded edition of Johnson's *Dictionary*.

Todd, James Henthorn, D.D., a distinguished Irish scholar, was born at Dublin, Ireland, April 23, 1805, and graduated at Trinity College, Dublin, of which he became a fellow in 1831. Entering the Church, he was appointed professor of Hebrew (1849), and librarian of Dublin University (1852); was twice chosen Donellan lecturer, became treasurer and precentor of St. Patrick's Cathedral (1864), took a leading part in founding the Irish Archæological Society, and for five years was president of the Royal Irish Academy. He died at Rathfarnham, near Dublin, 28th June 1869. His most important works are *St. Patrick, Apostle of Ireland* (1863), and editions of ancient Irish records, as *The Martyrology of Donegal*, *The Book of Hymns of the Ancient Church of Ireland* (1855), the Irish version of Nennius (1848), and *The Wars of the Gaedhill with the Gaill*.

Todd, John, D.D., an American divine and author, born at Rutland, Vermont, U.S., October 9, 1800, graduated at Yale College in 1822, and at Andover in 1826, and was successively pastor of Congregational churches at Groton (1827–31), Northampton (1833–36), Philadelphia (1836–42), and Pittsfield (1842–72), where he died, August 24, 1873. He wrote a large number of works, some of which attained a wide circulation both at home and in England. The chief are *Lectures to Children* (1834), *Student's Manual* (1835), *Index Rerum* (1835), *Truth made Simple* (1839), *The Young Man* (1843), *The Daughter at School* (1854), *Mountain Gems* (1864), *Woman's Rights* (1867), *Sunset Land, or the Great Pacific Slope* (1869), and *Old-Fashioned Lives* (1870). See *John Todd, the Story of his Life, told mainly by Himself* (New York 1876), edited by the Rev. John E. Todd.

Todd'y is the name given to a saccharine juice drawn from palm-trees in India and Ceylon, and which, when fermented, yields an alcoholic beverage. Whisky T. is a beverage which enjoys undiminished popularity in Scotland. It is made by dissolving a proportion of sugar in a wineglassful of boiling water, adding a glass of malt whisky, and thereafter from one to two glasses more of boiling water. Quantities may be varied according to taste, but T. should contain nothing more than pure sugar, good whisky, and boiling water.

Tod'hunter, Isaac, M.A., F.R.S., son of a dissenting minister, was born at Rye, in 1820, and after studying at University College, London, accepted for a time the post of tutor in a school at Wimbledon, from which he passed to St. John's College, Cambridge, where he graduated Senior Wrangler in 1848. Since then he has resided at Cambridge as fellow, assistant-tutor, and principal mathematical lecturer of his college. He has written numerous text-books on various branches of mathematics, including, besides the usual elementary works on geometry, algebra, trigonometry (plane and spherical), and natural philosophy (2 vols.), standard treatises on more advanced portions, such as the *Theory of Equations* (1861), *Plane Co-ordinate Geometry* (5th ed. 1874), *Analytical Statics* (1866), *Differential Calculus* (7th ed. 1878), *Integral Calculus* (4th ed. 1878), *Mathematical Theory of Probabilities* (1865), and an *Elementary Treatise on Laplace's, Lamé's, and Bessel's Functions* (1875). Perhaps the most valuable of his writings are *Researches in the Calculus of Variations*, which obtained the Adam's Prize in 1871, and *A History of the Mathematical Theories of Attraction and the Figure of the Earth from the Time of Newton to that of Laplace* (2 vols. 1873). He is also author of a volume of essays entitled *The Conflict of Studies* (1873).

Todle'ben, Franz Edward, a distinguished Russian general, a son of one of the Kaufmanns, was born at Mitau, Kurland, May 8, 1818, and educated at Riga, and at the College of Engineers in St. Petersburg. He served in the Caucasus against Schamyl, 1848–51, and under General Schilders in the Danubian campaign of 1853–54, and on the outbreak of the Crimean War was ordered to the defence of Sebastopol against the Allies. By cumulating the fire of the garrison on the works of the Allies, and pushing forward with prodigious energy the construction of the fortifications of defence, T. rapidly turned the tables on his

enemy, and asserted an engineering superiority over the attack. His skill, perseverance, and activity seemed to conjure up, as if by magic, the massive ramparts which prolonged the siege for 349 days (see SEBASTOPOL). T. was raised to the rank of General of Engineers, and received the order of St. George in 1858. The *Journal of the Defence* was subsequently expanded into the *Défense de Sevastopol; Ouvrage rédigé sous la Direction de Lieutenant General E. de T.* (2 vols. 4to, with elaborate maps, 1863-70). In this work, which appeared simultaneously in Russian, French, and German, the technical account of the engineering work is supplemented by a full account of infantry and artillery operations. One of its conclusions is that, in spite of the opinion of many military authorities to the effect that 'it is useless in time of peace to expend immense sums on permanent fortifications: . . . the defence of Sebastopol has proved directly the reverse.' T. was intrusted with the defence of Nicolaiev and Cronstadt, and as 'adjoint' to the inspector-general of engineering (the Grand-Duke Nicholas), he exercised *de facto* the functions of that office from 1860. In September 1877, after the failure of the great attack on Plevna (q. v.), he was summoned to the direction, and completely changing the Russian tactics, completed the investment by the construction of works on the W. side, and so, by intercepting all reinforcements and supplies, ultimately starved Osman Pasha (q. v.) into surrender on December 11, with 20,000 men and 60 guns. On 28th March 1878 T. succeeded the Grand Duke Nicholas as commander-in-chief of the army in Turkey, and in December following was appointed General of the 7th Grenadiers, and by special ukase the regiment received his name.

Todmor'den, a market town on the borders of Lancashire and Yorkshire, 9 miles N.N.E. of Rochdale by rail, is picturesquely situated in a hill-girt valley, watered by the Calder. It contains five Anglican churches and numerous chapels, an Oddfellows' hall, a masonic hall, and a new town-hall (1875) in the Corinthian Order, in front of which stands a bronze statue by Foley of the late John Fielden, M.P. Besides enormous cotton-mills, there are manufactories of calicoes, fustians, dimities, and bobbins, iron foundries, and machine works, &c. T. publishes two weekly newspapers. Pop. (1871) 7836.

Toff'ee is a confection prepared by boiling sugar with a proportion of butter, and casting the boiled compound into cakes on a slab.

To'ga (Lat. 'covering,' from *tego*) was the distinctive dress of a Roman civilian. It consisted of a large piece of white woollen cloth more or less shaped like a segment of a circle, and was thrown loosely round the body in a manner the details of which varied with the fashion of the time and perhaps the taste of the individual. At first the T. was worn alone, but it soon became customary to have a *tunica* under it, and in the latter days of the republic it was superseded even as an upper garment by the more luxurious *pallium* or *lacerna*, still appearing, however, occasionally even under the empire somewhat as our obsolete court-dress does among us. Persons accused of any crime allowed their T. to become soiled (*T. sordidata*) as a sign of dejection; candidates for public offices, on the other hand, whitened it artificially with chalk (*T. candida*); while mourners wore a *T. pulla* of naturally black wool. The *T. picta* or embroidered T. was worn by high officers on special occasions, such as the celebration of a triumph, the ordinary dress of magistrates being the *T. prætexta*, whose only adornment was a deep purple border, and which was worn also along with the *bulla* by children of both sexes.

Toise, an old French unit measure of length, has been superseded since the beginning of this century by the *mètre*. The linear T. contained 6 feet or 72 inches, the square T. 36 sq. feet, and the cubic T. 216 cubic feet. The linear T. was equal to 1·949 mètres, or nearly 6·35 English feet.

Tokat', a town of Asiatic Turkey on the Tosanly-su, a tributary of the Kizil-Irmak, 50 miles N.N.W. of Sivas. It occupies a circular valley and contains a citadel, a splendid but ruinous palace, a bridge, and a mosque. It is the seat of an Armenian archbishop and an important caravan-station. Copper-smelting is actively carried on. Pop. 45,000 (26,000 Turks, 15,000 Armenians). T. is the Byzantine *Eudokia*.

Tokay' is a very celebrated variety of white wine cultivated and produced in Hungary, in the valleys of the Waag and the Gran on the left bank of the Danube. The grape from which T. is made is known locally as *Io Formint*. The berries are medium-sized, of a yellowish-green colour, and grow in large, loose, pendulous branches on a strong vine. Their juice is sweet, and has a very distinct and peculiar flavour. Five different varieties of true T. are commercially distinguished—1st, *Essence*, a sweet light wine containing not more than 7 per cent. of alcohol, and which must be very old (from 40 to 50 years) before it is in perfect condition. 2d, *Ausbruch* T., also a sweet, but more highly alcoholic wine. 3d, *Maszlacs* T. 4th, *Szamoroauy*, or dry T., and 5th, *Ordinari*. The annual produce of the various qualities of T. is estimated to equal 268,000 eimer (upwards of 3,800,000 gallons); but of the very finest quality, which is more a liqueur than a wine in the ordinary sense, very little is produced, and it is strictly preserved for the emperor and a few nobles, in whose hands is the very limited tract of the T. vineyard (Mezes Malé) capable of yielding it. The finest qualities of old T. found in the market sell at prices ranging from £2 to £3 per bottle.

To'kens, a kind of unauthorised coinage, current at certain periods in Britain, first appear in the reign of Henry VIII., and were finally abolished in 1817. James I. and Charles I. endeavoured to restrict the issue of T. to certain privileged parties, but without success. In the end of last century the Bank of England issued *bank T.*, silver pieces of the respective values of 5s., 3s., and 1s. 6d. Ordinary T., which were mostly used by small tradesmen to represent the fractions of a penny, were made of lead, copper, tin, brass, or even leather, and stamped by the issuing shop. The recently-introduced British Workman Public House tallies closely resemble the old T. In the Scotch churches T. are small leaden tallies issued to persons in full communion with the Church previous to the periodic celebration of the Lord's Supper, and handed in by them on their taking their seat at the table. These tallies are now being gradually superseded by cards.

Tokio, the official name of Yeddo (q. v.).

Tök'öly, Emeric, Count, born at the castle of Käsmark, in the Hungarian comitat of Zip, in 1656, on the death of his father, a Protestant noble and insurgent (1671), fled to Transylvania. Here Prince Apafi gave him the command of troops, with which, in 1678, joining the Magyar patriots, he ravaged Moravia, took Kaschau (1682), and marched with the Turks upon Vienna. Treacherously arrested by Kara Mustapha (1685) and sent to the Sultan at Adrianople, T. was released in 1686 and furnished with 9000 Turkish soldiers for further operations against Austria. Created Prince of Transylvania, he defeated Heusler at Yernesi (1689), but was compelled to retreat before the Prince of Baden into Wallachia. He later shared in almost all the Turkish operations against the Austrians, and, excluded from the amnesty that followed the Peace of Karlowitz (1699), lived at Constantinople, dying on his estate of Ismid, 13th September 1705.

To'land, Janus Junius, afterwards **John**, one of the most notable of the 'English Deists,' was born at Redcastle, Ireland, 30th November 1670. He studied at the universities of Glasgow, Edinburgh (where he took the degree of M.A. in 1690), Leyden, and Oxford. In 1696 he published his famous work, *Christianity not Mysterious* (first two editions anonymously, 3d, 1702, with name). The work was to consist of three parts, of which the first done was unpublished. In the first it was affirmed that among the very essentials of true religion were clearness and intelligibility, and that these were contained in Christianity. The second was to be a rational explanation of the reputed mysteries of the Gospels; the third was to show that nothing unreasonable was contained in the Evangelists. The general scope of the book was to limit the sphere of the supernatural, not to reject it altogether; but notwithstanding this it created an immense uproar. The clergy thundered against it from the pulpit, or wrote in refutation of his arguments. In 1697 T. visited Ireland, in the wake of his unpopular work, but found no toleration of its doctrines there. The Irish Parliament, who would have disdained not merely to read but to touch the work, severely condemned at once the book and the author. The former was burnt by the common hang-

man of the city of Dublin, with an imposing display of civic ceremony, and the Lower House of Convocation of the Irish Church, in condemning the book, blamed Parliament for not extending a similar punishment to the latter. T., who was an intensely vain man, was delighted at this uproar, until it became too furious, and he was obliged again to remove from Ireland. The rest of T.'s life was a troubled one. He was in want of money, and had to support himself by doing any stray piece of work that he could procure. His other writings were for the most part fragmentary. The chief were: *Life of Milton* (1698), *Anglia Libra* (1701), *Socinianism Truly Stated* (1705), *Nazarenes* (1718), *Tetrydymus* (1720), *Pantheisticon* (1750). The last of these works 'amounts to a distinct avowal by T. of Pantheism.' He died at Putney, 11th March 1722. A man of inordinate vanity, T. nevertheless possessed considerable powers of mind, and an ardent love of knowledge and speculation. To estimate his full importance he must be known in connection with the religious history of his own day. See Lechler's *Geschichte des Englischen Deismus* (Stuttg. 1841), Hunt's *Religious Thought in England* (vol. ii. Lond. 1871), and Leslie Stephen's *English Thought* (vol. i. Lond. 1876).

Tole'do, a walled town of Spain, capital of the province of the same name, picturesquely situated on a steep hill overlooking the Tagus, 56½ miles S.S.W. of Madrid by rail. Pop. (1877) 17,273. It has twenty-six churches, numerous monasteries, and with its old gates, bridges, and towers, has a very imposing appearance. Its streets are irregular and crooked. The chief buildings are the cathedral, the metropolitan church of Spain, 426 feet long by 216 wide, with five naves supported by 84 columns, 40 side-chapels, in one of which the Mozarabic or Gothic liturgy is still used, many royal sepulchres, rich art treasures, and (in the chapter-house) a library of rare MSS.; the Alcázar, now used as a barrack; the Palace of the Inquisition, now the government buildings; the Vargas Palace, the townhouse, two gates of Arabic workmanship, and two high bridges. Near the Tagus is the great royal manufactory of T. blades, with numerous forges and smithies. T. also manufactures silks, gold and silver stuffs, and exports the famous Marcipan. The University of T. declined in 1498. T. is the *Toletum* of the Romans, a fortified town of Hispania Tarraconensis. It was early famous for its manufacture of steel, and in the time of Julius Cæsar was a great arsenal. From 576 to 711 it was the royal residence of the West Goths.

Tole'do, a city of Ohio, U.S., on the Maumee River, 9 miles from its mouth at Lake Erie, at the terminus of the Wabash, Erie, and Miami canals. It had (1877) 50 churches, 37 schools, a trades' college, a public library of 10,000 vols., and 3 daily and 15 weekly newspapers. T. contains the largest waggon-work in the United States. The other manufactures are bridge and boat building and cabinetmaking, and there is an active trade in general goods. In 1875 T. received 92,946,379 feet of lumber, 15,390,000 laths, and 16,303,000 shingles, and sent by lake and railway to the Eastern states or abroad 740,758 barrels of flour, 6,709,686 bushels of wheat, and 14,928,589 bushels of corn. T. was incorporated in 1836. Pop. (1876) 60,000.

Tolenti'no (anc. *Tolentinum*), a town of Italy, province of Macerata, on the Chienti, 16½ miles S.W. of Macerata by the highroad. It contains the cathedral of *S. Niccolo di T.*, with rich carving and frescoes, also a town-hall, a Gothic gateway, and an art-school. There are manufactures of leather, and of cast-iron and woollen goods. Pop. (1874) 4289. At T. was signed in 1797 a treaty between Bonaparte and Pius VI.; here also the Austrians defeated Murat in 1815.

Tolera'tion is the liberty given to a minority in the state freely and openly to express their opinions on religious and political subjects. Its root idea is the personal liberty of the individual—one man has a right to action unhindered by others unless he injures them. This is a principle which will be admitted by nearly everybody; but the real difficulty is to decide where the exact line of limitation is to be drawn between the general rule and its exceptions.

In the ancient civilised communities of Greece and Rome it may be broadly stated that there was complete religious toleration. The apparent exceptions, of which the most celebrated is the case of Socrates (q. v.), need not detain us. But the reason is plain. Religious ideas had not the force then they have now. Men were for the most part indifferent, and the consequence was that few were inclined to stray from the ordinary paths, and if they did so they were left unpunished. In the modern world all has been changed. A definite system of theological doctrine was evolved from the elements of Christianity. Men were commanded to believe it under the fearful penalty of eternal perdition. Later there were sects, and each believed that its way was the only safe way for man. Then the whole of modern life is richer and more diversified than that of the classic world. Thus the conditions became reversed. There was at once a greater tendency towards diversity, and towards the restraining of that diversity. The argument of the persecutor was briefly this:—Eternal ruin follows the rejection of this doctrine. Those who reject it or who persuade their fellows to do so must for their own sakes and the sake of others be restrained. Although the Reformers were inclined to persecute quite as hotly as the Catholics, this must not blind us to the fact that the principles on which the Reformation was founded finally led to T. The present broke with the past on many important points. A dead level of uniformity became more and more impossible, and men gradually became reconciled to the existence side by side with themselves of men who differed from them. One of the chief causes of religious T. in our own time is the diminished sense of the supernatural. We do not persecute for the same reason that the ancient world did not. Something must also be assigned to higher motives. The true spirit of Christianity has never been better understood than in our own day, and in its essentials the religion of love is pre-eminently the religion of T.

As regards political T., it is evident that it can really exist only in a republic or limited monarchy. No despotic government will admit free opinion if that free opinion be dangerous to it, and where is it not? The ideal of political T. is to be found in a state where the minority have full power to express their opinions. These opinions become (let us suppose) the opinions of a majority. That majority then quietly and constitutionally succeeds to power, and the former majority is now in its turn the minority.

The earliest expression of the principle of T. in English literature occurs in the last chapter of Sir T. More's *Utopia*. Milton's *Areopagitica*, Jeremy Taylor's *Liberty of Prophesying*, Locke's *Letters on T.*, are noble though not quite flawless contributions to the theory of the subject. In our own time the whole matter has been admirably discussed in J. S. Mill's treatise *On Liberty*, perhaps the most valuable of his many contributions to the cause of human advancement.

Tolera'tion Act. See ACT OF TOLERATION.

Toll'ens, Hendrik Van, one of the greatest of modern Dutch poets, was born at Rotterdam, September 24, 1780. He was trained to business by his father, but his bent towards the study of modern languages and poetry could not be resisted. After some translations from French and German, he published the comedies *De Bruilafd* (1799), and *Gierigheid en Baadzucht* (1801), and the tragedy *Konstantijn*, all which he afterwards excluded from the collected edition of his works. He issued three small volumes of *Idyllen en minnezongen* in 1801 and 1805, and gained the second prize for his *Lofdicht op Hugo de Groot* (1803), and the first for *Egmond en Hoorne* (1805). A collection of his *Gedichten* (3 vols. Haag and Rotterd. 1808–15; 5th ed. 1831) was very favourably received; *Vaterlandisch Krijgslied* (1815) and *Wien Nêerlands Bloed* (1816) made him the favourite poet of the people; and the third edition of his *Gedichten* in 1817 found 10,000 subscribers. T.'s longer work, *Tafereel van de overwintering der Nederlanders op Nova Zembla* 1596 *en* 1597 (1816; 9th ed. Leuwarden 1872), is a masterpiece of descriptive poetry. The other chief works of T. are *Romanzen, Balladen, en Legenden* (2 vols. 1818–19), *Nieuwe Gedichten* (1821 and 1829), *Volksliederen* (1833), and *Laatste Gedichten* (1848–1853). During the publication of his *Gezamentlijke Dichtwerken* (8 vols. 1855–57), T. died at Ryswijk, October 21, 1856.

Tolls are placed at turnpikes by road trustees, acting by authority of Parliament. They were formerly used for any kind of custom. See BAR, TOLL; HIGHWAYS, LAW REGARDING.

Tolo'sa, a town in the province of Guipuzcoa, Spain, 16 miles S. of San Sebastian. It has zinc and lead mines, and manufactures of paper and arms. Pop. (1870) 4200.

Tol'tecs, a Mexican race who are supposed to have been supreme in Central America from the 7th to the 11th centuries. They were completely obliterated by the Aztecs (q. v.) and Tezcucans, who held the country when the Spaniards first landed. The latter races were of a martial spirit, but they were indebted for their arts, their civilisation, and their religion to their milder predecessors. The T. present striking analogies to the Etruscans, and in a less degree to the Egyptians and Assyrians. They were great builders, and their religion was a mystic system of great complexity, intimately connected with the study of astronomy, and interpreted by a priesthood, who formed an exclusive caste. See Prescott's *History of the Conquest of Mexico*, book i.

To'lu. See BALSAM.

Tolu'ca, a town of the Mexican confederation, capital of the state of Mexico, 20 miles S.W. of Mexico city by rail. It stands in a fertile district, has manufactures of soap and candles, and exports vast quantities of hams. Many swine are reared in the neighbourhood, and much maize is grown. The district is subject to earthquakes. Pop. 12,000.

Tom'ahawk, a war hatchet used by N. American Indians. It is either wielded or thrown with unerring aim. Sometimes a tobacco pipe is combined with the T., the handle of which is drilled to meet a pipe-bowl fastened to the pole of the axe. The Indians are now supplied with these instruments by traders.

Toma'to (Sp.-American *tamate*), or **Love-Apple** (*Solanum Lycopersicum*), is a trailing annual plant, a native of the warmer parts of America (but not now known in a wild state there), introduced into Europe about the beginning of the 16th c., and since that time cultivated for its fleshy esculent fruit. In S. Europe—particularly Italy—it thrives in perfection, and has become a common article of food. In a green state the fruit is pickled; when ripe it may be eaten raw, or cooked in a variety of ways. An excellent sauce is also prepared from the juice. Several varieties exist differing in shape and colour of the fruit.

Tomb (Gr. *tymbos*), a term applied to a grave as well as to a monument raised over it. In the mounds of earth or stones plentifully found in Europe we see examples of the most primitive burial-places (see BARROW and CAIRN); and the Cromlech (q. v.) and Dolmen (q. v.) of Western Europe are also now recognised as prehistoric tombs. Natural caverns and subterraneous passages and chambers hollowed out by art were likewise early used as places of sepulture in Egypt, Palestine, Asia Minor, Arabia, Greece, and at Rome, Cyrene, and other places. Many ancient rock-cut sepulchral chambers are internally decorated (see CATACOMBS); and others, as those of Phrygia and Lycia, are remarkable for elegant façades worked in the living rock. Of all the tombs of antiquity the pyramids of Egypt (see PYRAMID) are unsurpassed for magnitude and importance. The Greeks had a great variety of tombs—the earth-mound, and buildings constructed of hewn stones developed from it, other detached buildings displaying architectural beauty cut from the rock, and in later times chaste and graceful *steles* or pillars, columns, and small temples, which were chiefly erected in the sepulchres outside the walls of the cities. One of the most splendid sepulchral monuments of all time was the tomb of Mausolus, king of Caria, at Halicarnassus (see MAUSOLEUM). Like those of the Greeks, the grave-monuments of the Romans were of very varied form. The tombs erected by Augustus and Hadrian to commemorate themselves and their successors were remarkable for their size and grandeur. The Via Appia was for several miles adorned with sepulchral monuments; and in 'the street of graves' at Pompeii, specimens of small tombs have been preserved. (See COLUMBARIUM.) During the dark ages mortuary memorials were neglected, but at the *Renaissance* the talents of great artists were again exercised in their construction. Several Indian mausoleums, for instance the Taj Mehal at Agra, are edifices at once elegant and magnificent.

Tom'bac, an alloy of copper and zinc, with a greater proportion of zinc than brass.

Tombig'bee, a river which rises in Mississippi, U.S., and after a S. by E. course of 450 miles through that state and Alabama, joins the Alabama River 45 miles above Mobile, after which the united stream is called Mobile River. The T. is navigable for 410 miles from Mobile Bay.

Tommase'o, Niccolò, a prolific Italian writer, was born at Sebenico in Dalmatia in 1803. After a course of study at Padua, he worked at Florence for the *Antologia di Firenze*, and in 1833 went to France, and after a stay of some years to Corsica. In 1838 he came to Venice, where, in consequence of a petition to the Emperor for a milder exercise of the censorship, he was arrested together with Daniel Manin (January 18, 1848). Liberated by the people on the 17th March, he eagerly entered into the struggle for independence, and was appointed, under the provisional government of Manin, minister of public worship. On the downfall of the Venetian Republic (August 1849) he retired to Corfu, where he prosecuted his arduous studies, though he had become almost blind in consequence of a severe illness. In 1854 he returned to Turin, and in 1859 settled at Florence, where he died May 1, 1874. As a writer T. was distinguished by profound and wide learning, and by the rare union of Catholic feeling with liberalism and patriotism. Of his numerous philosophical and critical works, the principal are *Dell' Educazione* (Lugano 1834; 3d ed. 1836); *Nuovi Scritti* (4 vols. Ven. 1839-40); *Studi Critici* (2 vols. Ven. 1843); and *Della pena di Morte* (Flor. 1865). His political writings he collected and published under the title *Il secondo Esiglio* (Milan, 3 vols. 1862). In philology the chief are his *Dizionario dei Sinonimi della lingua Italiana* (5th ed. 2 vols. Milan 1867), and *Nuovi Studi su Dante* (Tur. 1865). Important for the history of literature are his *Canti popolari Toscani, Corsici, Illirici, Greci* (Ven. 2 vols. 1843); and his *Lettere di Santa-Caterina di Siena* (Flor. 4 vols. 1860). He also edited the *Lettere di Pasquale de' Paoli* (Flor. 1846), and wrote two novels, *Il duca d'Atene* (Par. 1836) and *Fede e Bellezza* (Milan 1852), besides several lyrical poems. See Bernardi, *Vita e Scritti di Niccolo T.* (Tur. 1874).

Tomsk, a government of the Russian Empire, in W. Siberia, between the governments of Tobolsk and Yeniseisk. Area 329,020 sq. miles; pop. (1874) 855,000, chiefly Russians (including, in 1874, 2210 exiles), Tartars, and (about the sources of the Obi) Kalmuks. The S.E. is occupied by the Altai Mountains; the rest consists of great steppes, marshes, and woods. T. forms part of the basin of the Obi (q. v.). In the N.W. are salt lakes, occupying an area of 1930 sq. miles. Cattle-breeding is the main industry, much curbed by cattle plague, which in 1874 destroyed 18,000 sheep. In the same year the Altai mines produced 5405 lbs. of gold, and from the eight imperial smelting furnaces issued 21,912 lbs. of silver, 1,270,645 lbs. of lead, 1,514,856 of copper, 1,100,000 of cast iron. Two great annual fairs are held, Susunkij and Vosnesensk. **T.**, the capital and official centre of W. Siberia, on the Tom, 55 miles from its confluence with the Obi, has several churches and schools, fine private buildings and active trade. A university will be opened here July 1, 1880. Pop. (1870) 25,605.

Ton (Old Eng. *tynan*, 'to hedge,' akin to Goth. *tains*, 'a twig'), a frequent suffix in English local nomenclature (Brixton, Brighton, &c.), rarely met with in Germany (Altona and Osttönne), but frequently in Sweden (Sigtuna, Frotuna, &c.). Its original meaning of 'enclosure' is preserved in its application to the lone Kentish farmsteads of Appleton and Godington; but ordinarily the *ton* became the nucleus of a village, the village of a *town*.

Ton, a denomination of weight used in Britain and America, and equivalent to 20 hundredweights. Hence in Britain it contains 2240 lbs. avoirdupois, and in America 2000 lbs. For the measure of capacity, see TUN.

Tone, Theobald Wolfe, born in Dublin, 20th June 1763, was educated at Trinity College, and coming to London to study law, was called to the bar at the Middle Temple (1789). The outbreak of the French Revolution drew him to politics, and having promoted the fraternisation of Irish Catholics and Dissenters, he founded in 1791 the society of United Irishmen. The discovery of his intrigues with France drove him a fugitive to the United States (1795). Thence crossing to France, he sailed in the squadron, dispatched by the Directory to Bantry Bay (1796); next served a year in the Bavarian army; till, joining once more a French expedition to Ireland, he was taken prisoner, and brought to Dublin, where, sentenced to death by a court-martial, he committed suicide in prison, 19th November 1798. See his *Autobiography* (Wash. 1826), and Madden's *Lives of the United Irishmen* (new ed. Lond. 1858).

Tone, in music, may mean (1) the interval of a second or the distance between two sounds having only one sound between them. In theory some tones are greater than others, but in instruments tuned according to equal temperament (see TEMPERAMENT) tones are all equal intervals, while each T. is of the value of two semitones; (2) tune. The word T. is used in this sense in the term Gregorian T.

Ton'ga Islands. See FRIENDLY ISLANDS.

Tongres (Flem. *Tongren*), an ancient town of Belgium, province of Limburg, on the Jaar, 12 miles N.N.W. of Liège by rail. Its church of Notre Dame (1240) was the first dedicated to the Virgin N. of the Alps, and has a cloister of the 10th c., the oldest in the Netherlands. The hot spring in the vicinity was known to the Romans, and its virtues are described by Pliny. T. has industries in brewing, tanning, and the making of tiles and chicory. Pop. (1873) 7080.

Tongue, the organ of taste, in higher animals is a fleshy muscular body, attached posteriorly to the *hyoid bone*, and occupying the floor of the mouth. It is absent in some Vertebrates, as *Pipæ*, or Surinam toads, and in some fishes (*e.g.* Siluroids). In many fishes it is devoid of muscular tissue. In some birds, also, it is a mere horny investment of the hyoid bone. In the woodpeckers the T. resembles a mobile dart used to impale insects; but in the parrot tribe it is fleshy. In serpents and some lizards the T. is very extensile and bifid at its tip; and in frogs and toads it is immovable in front but free behind. In dolphins the T. forms the floor of the mouth, and is immobile. In Carnivora (*e.g.* Lion) the papillæ are large and horny, and are used in tearing the flesh off the bones of the prey. In the dog, mole, &c., a curious solid body, the *worm* or *lytta* is attached to the under surface of the T. In the Javan porcupine the T. is covered with horny plates. In the elephant it is smooth, and has but little flexibility; but in the Mamidæ or pangolins it is exceedingly long, and provided in the Tamandua ant-eater with recurved spines. In man the T. is bound to the hyoid bone by numerous muscles, and is also attached to the epiglottis by ligamentous folds of mucous membrane. It is connected with the lower jaw by the *genio-hyo-glossi muscles*, and a fold of mucous membrane called the *frænum linguæ*. The *dorsum* or upper surface of the T. in man is convex, and is divided into two halves by a median line or *naphe*. In front the surface is rough owing to the presence of numerous projections or *papillæ*; the posterior part is smooth. The papillæ are the organs of taste. They exhibit three varieties:—(1) the *circumvallate*, numbering from 8 to 10, placed at the back part of the T., and forming a double or V-shaped row behind. Each circumvallate papilla measures from $\frac{1}{16}$th to $\frac{1}{12}$th of an inch in diameter, and consists of a central portion placed inside a cup-shaped depression. (2) The *fungiform* papillæ of the T. are scattered over its dorsal surface, and are of large size and deep-red colour. They are covered each with smaller or secondary papillæ. (3) The *conical* or *filiform* papillæ are situated on the front part of the T. They are of small size and conical form; their colour is whitish, and they also exhibit a division into secondary papillæ. *Simple* papillæ are also found on the T. There are also numerous *mucous follicles* and *glands*. The *substance* of the T. itself is made up of *extrinsic* and *intrinsic muscles*, the latter being arranged to form longitudinal and transverse fibres. The T. derives its nerves from three sources—the *gustatory branch* of the fifth nerve; the *lingual branch* of the *glosso-pharyngeal*; and the *hypoglossal nerve*, the latter supplying the *muscles* of the T., and being therefore *motor* in its nature. The two former nerves are those which supply the T. with *common sensation* and with *Taste* (q. v.). It is a curious but well-ascertained fact that the T. is not essential to *speech*. Many cases are recorded in which little or no difficulty in articulation has followed excision of the T.

Diseases of the T.—T.-tie is a frequent deformity in infancy, which, in certain cases, may prevent the child from sucking, and may, in after life, interfere with articulation. This condition may be very easily and safely relieved by making with the scissors a little nick through the semi-transparent edge of the constricting tissue, all that is necessary being to avoid dividing the ranine artery as it passes along the *frænum linguæ*. *Ulceration* of the T. may occur under the following forms, the irritable, the dyspeptic, the syphilitic, and the cancerous. 1. *Irritable* ulcers of the T. may be excited by the irritation of rough teeth. They are often very painful; are apt to become phagedænic; and are often accompanied by indigestion, owing to the imperfect mastication of food. The treatment consists in extracting or filing down the irritating teeth; correcting the state of the digestive organs, and attending to the local condition of the ulcers. A brisk aperient may be given, and the surface of the ulcers may be touched with nitrate of silver, either solid or in solution. 2. *Dyspeptic ulceration* of the T. may arise without any local irritation. The ulcer, which is usually situated at the middle of the T., is often accompanied by cracks and fissures in other parts of the T., and is frequently the result of psoriasis. The treatment is the same as in cases of dyspepsia; and after the unhealthy state of the mucous membrane has been corrected, the administration of tonics is necessary. 3. *Syphilitic ulceration* of the T. is a very serious disease; and, in its worst form, it appears as a large excavation with foul raised edges, and a sloughy surface on the back or sides of the T., which greatly resembles cancer. Such ulcerations are best treated by the calomel fumigation, which may be effected by adapting a mouthpiece to the vapourising machine, and inhaling the vapour. Five grains of calomel every night is the quantity usually prescribed, or the ulcer may be dusted daily with five grains of grey powder. 4. *Cancerous ulceration* is by far the most serious of the D. of the T. The ulcer generally appears on the side of the T. as a small common ulcer. The appearance of the ulcer is speedily followed by a deposit of hard tissue at its base, which spreads an indefinite distance into the substance of the T., causing pain, difficulty in articulation, loss of appetite, salivation; and the peculiar cancerous cachexia is always present. The disease is apt to spread to the floor of the mouth, or arches of the palate, and the glands below the jaw are generally early affected. If the cancerous nature of the affection is obvious, the only question is whether a surgical operation is to be recommended, and what operation should be performed. If the whole of the diseased tissues can be removed, temporary relief may be obtained; but if the floor of the mouth, or the palate, or the submaxillary glands be implicated, a surgical operation should not be recommended. *Acute inflammatory swelling* of the T., or *glossitis*, is a very uncommon affection; but may be caused by wounds or irritating substances, or by mercurial or iodine poisoning. *Abscess* in the T. appears as a deep-seated, elastic tumour, situated in the body of the T., and in such cases a small incision is all the treatment required.

There are also several congenital malformations of the T., as *macroglossia*, or congenital hypertrophy, the T. being so large that the child cannot close the jaws or speak intelligibly; *congenital fibroid tumour*, which may remain quiescent for a long time; and *fibrous* or other innocent tumours imbedded in the substance of the T. Nævi sometimes, but rarely, occur in the T.

Tongues, Gift of, one of the gifts enumerated in the First Epistle of Paul to the Corinthians (xii., xiv.) as possessed by Christians at that time; and according to the book of Acts (ii.) first bestowed at the Feast of Pentecost immediately after our Saviour's ascension. What ancient interpreters understood by 'speaking with tongues' (Acts ii. 4; 1 Cor. xii. 30) was a miraculous speaking of foreign languages. From the narrative in Acts there can be no reasonable doubt that the writer meant to convey the impression that the disciples were heard to speak in languages which they had not previously understood. The other instances recorded in Acts offer exactly the same phenomena (x. 46, xi. 15, xiv. 15-18, xix. 6). On the other hand, the G. of T. of 1 Cor. was not speaking in foreign languages, but rather in an exalted, ecstatic manner (xiv. 5, 14, 18, 28).

Ton'ic, in music, the first or initial note of any diatonic scale, also called the key-note or final. A composition written in any key closes naturally upon its T.

Ton'ics are medicinal substances which act upon the nutrition of the various tissues so as to restore lost tone by increasing power in the part. T. differ from astringents in that they affect nutrition, and from simple stimulants in that they increase power by increasing nutrition, their influence being permanent and not followed by depression. The administration of T. is indicated in cases of debility depending on actual loss of power, and in convalescence from acute disease; but they are contra-indicated in cases of plethora, and in sthenic inflammatory action. Most T., with the exception perhaps of iron, act primarily through

the nervous system, and produce their effects, secondarily, on the muscular system. The shower-bath, cold sea-bathing, open-air exercise, friction, galvanism, and electricity, may all be classed among tonic remedies; but the chief medicinal T. proper are (1) *simple bitters*, which act upon the stomach so as to invigorate digestion and affect the general nutrition; (2) *bitter* T., as quassia, gentian, calumba, eupatorium, &c.; (3) *peculiar bitters*, such as cinchona and quinia, which possess other properties in addition to those of the simple bitters; (4) *aromatic bitters*, which act upon the alimentary canal, and are dependent for their virtues upon the presence of a volatile oil, *e.g.* chamomile, serpentaria, cascarilla, and angustura; (5) *mineral* T., the various preparations of iron, sulphuric acid, muriatic acid, nitric acid, nitro-muriatic acid, phosphorus, &c.

Ton'ic Solfa' Sys'tem, a system of musical notation denoted by letters. Such a system was advocated by Thomas Salmon so long ago as 1672, in his *Essay to the Advancement of Music*, while a version of a scale invented by Rousseau, in which the notation consists of the numbers 1 to 7, is still used to a considerable extent in France. The originator of the system now in use (called by her tetrachordal) was Miss Glover of Norwich, but it is justly associated with the name of the Rev. John Curwen, who really developed it into an important method of musical instruction. Its main use is in elementary singing-classes, but its disciples are also taught through it the study of composition, harmony, and musical instruments. The key-note of any scale is always called *doh* whatever its pitch may be, the second *ray*, and so on; the notes being indicated by the initial letters **d**, **r**, **m**, **f**, **s**, **l**, and **t**. Higher octaves are shown thus $\mathbf{d}^1$ (doh one octave higher), $\mathbf{d}^2$ (doh two octaves higher), and so on, and lower octaves $\mathbf{d}_1$, $\mathbf{d}_2$, &c. Thus the first lines of the National Anthem appear as follows:—

d d r $\mathbf{t}_1$ d r m m f m r d r d $\mathbf{t}_1$ d.
God save our grac-ious Queen, Long live our no-ble Queen, God save the Queen.

Time and accent marks are represented by dashes and colons; a dash (|) preceding a note representing a strong accent, and a colon (:) a weak one. A dot (.) is half a colon, and a comma (,) half a dot. A stroke under a number of notes signifies that they are to be continued or sung to the same syllable. Thus, in the first line of 'Rule Britannia'—

.$\mathbf{s}_1$ | d : d | $\underline{\mathbf{d,r.m,f : s}}$.d | r : $\underline{\mathbf{r.m,f}}$ | m.
When Bri - tain first at heaven's com - mand.

The addition of *e* to the initial of the note, as *de*, *re*, *me*, &c., denotes a sharp, and of *a*, as *da*, *ra*, *ma*, &c., a flat. In a change of key, the note where the change takes place is printed in a double manner showing its position both in the old and new key. The sign, for example, of a note which was doh in the old and is sol in the new, is $^{\mathbf{d}}\mathbf{s}$. In teaching the system a musical chart of the scale, called the modulator, is used, representing pictorially the relative places of the notes of a scale and its minor modes, chromatics, &c. In the minor mode *lah* is the key-note, the sharp sixth being called *bah* and the sharp seventh *se*. The system has made very rapid progress, and is most extensively used in singing-classes both in this country and in America as well as in the colonies. Whatever may be urged against it as a means of education for trained musicians, who if educated only according to it must submit to absence of acquaintance with the great range of musical literature, it has certainly carried music to a large class of the community which previous movements had failed to reach. A Tonic Solfa Association was established in London in 1853, and the first concert in connection therewith at the Crystal Palace was given by 3000 children in 1857 with great success. Annual conferences of teachers of the system are now held in London and other large towns. The Tonic Solfa College was founded in 1862, and up to 1871 had issued 92,000 certificates of various kinds. A newspaper called the *Tonic Solfa Reporter* is regularly published. For a full account of the system and its history see the numerous works of Mr. J. Curwen, including the *Grammar of Vocal Music* (1848), *An Account of the Tonic Solfa Method* (1854), *The Art of Teaching Music, being the Teacher's Manual of the Tonic Solfa Method* (1876); also the *Story of Tonic Solfa* (1871).

Tonk (*Tank*), the capital of the native state of the same name in Rajputana, India, 218 miles S.W. of Delhi, and 289 N. of Mhow. It is of considerable size, with a wall and mud fort. The *state* of T. comprises six scattered districts. Area, 2730 sq. miles; pop. 320,000; revenue, £110,000. It is the only Mahommedan state in Rajputana, and the chief is styled Nawab.

Tonk'a Bean, or **Ton'ga Bean**, the seed of the *Dipterix odorata*, a large papilionaceous tree of the order *Leguminosæ*, included in the limited group bearing, instead of a pod, a fruit not opening at maturity—a drupe similar to the fruit of the almond. The seed owes its new-mown-hay flavour to coumarin ($C_9H_6O_2$). It is used by perfumers for scenting purposes, and the bean is sometimes carried in snuff-boxes to scent the snuff. The tree is a native of Cayenne. *D. eböensis* of the Mosquito coast has a 'bean' resembling the above, but scentless. There are six other species, all confined to tropical America.

Tonn'age is the registered capacity of a vessel, estimated according to a definite rule. Previous to 1836, the rule for estimating the T. was based upon an erroneous principle, and led to the construction of long narrow vessels. In 1835 a bill was passed to remedy this evil, and a new system of measuring T. was supplemented and improved by the Merchant Shipping Act of 1854. In making the estimate the length of the T. deck (the second deck from below, and therefore the upper deck in vessels with less than three decks) is divided into an even number of equal parts (4, 6, 8, 10, &c.), the number depending upon the length of the ship. At each of these divisions the transverse area is calculated according to a fixed rule; and then beginning with the extreme bow end these areas are numbered 1, 2, 3, &c., to the extreme stern end. To the sum of the first and last (if they yield anything) twice the sum of the remaining odd numbered areas and four times the sum of the even numbered areas are added, and the total sum is then multiplied by one-third the common distance between the areas. This product divided by 100 gives the estimated T. In a steam-ship allowance must be made for the content of the engine-room, which is deducted from the gross T. The estimate cannot be more than approximate, but it affords a sufficiently accurate method for comparing the relative capacities of vessels.

Tonn'age and Pound'age, duties of 3s. on every tun of wine, and 5 per cent. on other imports, were granted Edward III. by Parliament for a limited period, being designed to furnish the Crown with ready money in case of sudden emergencies. They were confirmed to Henry V. for life; but Henry VIII., though levying them from his accession, did not obtain a formal vote till six years later. Regarded gradually as a royal prerogative, they were one of the great points of contention between Parliament and Charles I., who, having endeavoured to exact them by the sole exercise of his authority, had to renounce such claims (1629). Charles II., James II., and William III. received a grant of them for life, but under Anne and George I. they were made perpetual and mortgaged for the public debt, and finally abolished by the Customs Consolidation Act of 1787.

Tönn'ing, or **Tönn'ingen**, a seaport of Prussia, province of Schleswig-Holstein, at the mouth of the Eider, 30 miles S.W. of Schleswig by rail. It has a fine harbour, a beautiful market-place, and an excellent school of navigation. T. carries on a large trade with England in cattle and Danish farm produce. Pop. (1875) 3130.

Ton'quin, the most northerly province of Anam, extends on the W. side of Further India, between lat. 20° and 23° N., along the Gulf of T., and is traversed by the river Song-koi, which enters it from the Chinese province of Yun-nan, and is navigable as far as Hanoi, the capital of T. (pop. 150,000), 40 miles above Hai-Phong, for vessels drawing from 4 to 6 feet. The chief port, the French settlement of Hai-Phong, on the Cua-cam, one of the mouth branches of the Song-koi, can be reached by vessels drawing 14 feet, and a Hong-Kong firm have several small river steamers plying between it and the interior. T. is very fertile, highly cultivated, and full of natural resources. It yields much rice (two crops yearly), cotton, &c.; produces silk, and in 1874 had in operation 14 gold, 7 silver, 3 copper, 1 zinc, 17 iron, and 3 salt mines. The climate is comparatively healthy for Europeans. The inhabitants are poor, and Chinese are indispensable as middlemen for commerce. T. was opened to foreign trade by French treaty of March 15, 1874, but the privilege will be little appreciated till the province becomes the road to Yun-nan, with its vast store of metals. In 1877 the imports

Top'-Shells (*Turbinidæ*), a family of *Gasteropodous* molluscs in which the shell is usually turbinate or top-shaped, but may be pyramidal. It is generally nacreous internally. The *operculum* is horny, and may exhibit a spiral form. In *Turbo* itself the shell is top-shaped with a rounded base. The whorls are convex, and the aperture is large, the operculum being calcareous. The genus *Trochus* also belongs to the T.-S. In the latter genus the shell is pyramidal and the base flattened, the operculum being horny. The common top is the *Trochus zizyphnus*. Others are the *Turbo versicolor*, the *Trochus Imperialis*, and the *Trochus niloticus*.

Tor (Celt. 'projecting rock') is of frequent occurrence in the local nomenclature of Devon and Derbyshire, and possibly may be recognised in the *Tauren* of the Tyrol.

Torbanehill' Min'eral, or **Boghead' Cann'el Coal**, a body very rich in volatile carbon compounds, found near Bathgate in Scotland. The deposit is now nearly exhausted, but at one time it was in great request for enriching gas and for the distillation of paraffin oil. It gave rise to a famous lawsuit, in which the question 'What is Coal?' was keenly discussed from a scientific point of view.

Torfæ'us (Latinised form of **Torfason**), **Thormodr**, a Danish historian, was born at Engö, Iceland, May 27, 1636. In 1662 he was sent by Frederik III. to Iceland to collect MSS. of sagas, and he was afterwards successively appointed royal antiquary (1667), and historiographer-royal (1682). He died at Karmö, near Stavanger, Norway, January 31, 1719. Of his many historical works the chief are *De Rebus Gestis Faröensium* (1695); *Series Dynastarum et Regum Daniæ* (1702); *Historia Vinlandiæ Antiquæ* (1705); *Grœnlandia Antiqua* (1706); and *Historia Rerum Norvegicarum* (4 vols. fol. 1711).

Tor'gau, a town and fortress of the second rank, in the province of Sachsen, Prussia, on the left bank of the Elbe, 47¾ miles E. of Halle by rail. It contains three churches—two Lutheran and one Catholic. The castle of Hartenfels, built in 1481, is now used as barracks. Two good bridges cross the Elbe here. The manufacture of hosiery, weaving, and corn-grinding are the chief industries. Pop. (1875) 10,730. Since the Emperor Heinrich I.'s time T. has been important in German history. It was here in 1530 that the Lutherans drew up the 'T. articles.' The place was fortified by order of Napoleon in 1810. During the War of Liberation it sustained a three months' blockade, and finally capitulated to Tauenzien, 14th January 1814. On this occasion upwards of 28,000 French soldiers (sent hither partly from the Dresden hospital) perished at T. of typhus fever.

Tor'mentil (*Potentilla tormentilla*), a stout-rooted perennial with slender annual stems, which bear sessile ternate leaves and small yellow flowers, with usually four petals and eight sepals. It is common in northern Europe, occurring plentifully in Britain on heaths, moors, &c., up to 3300 feet. The rootstock is sufficiently astringent to be used for tanning. A decoction of it in milk has been given in diarrhœa and dysentery with success, and an extract has been recommended to strengthen the gums and fasten the teeth. Linnæus says the Laplanders colour leather red with the juice.

Torna'do. See WHIRLWIND.

Tor'nea, a small Russian town in N. Finland, in the government of Uleaborg, at the mouth of the river T. It has less commercial importance than the Swedish frontier-town Haparanda, opposite to it. From the summit of the mountain Afvasaxa, 31 miles to the N., the sun is visible during the whole night from the 16th to the 30th June. Pop. (1876) 892.

Tor'nea, a river forming part of the boundary between Sweden and Russia, rises in Lake Tornea-Träsk, and flows S.E. and S., falling into the Gulf of Bothnia after a course of 260 miles.

To'ro, a town of Spain, province of Zamora, on the Duero, 19¾ miles by rail E. of Zamora. It has 21 churches and 14 monasteries. The river is here crossed by five bridges. Once an important city, it has in modern times greatly declined. Pop. 8430.

Toron'to, a city of the Dominion of Canada, capital of the province of Ontario, on the N.W. shore of Lake Ontario, 45 miles N. of the Niagara Falls, 333 W.S.W. of Montreal, 513 S.W. of Quebec, and 500 N.W. of New York. The Bay of T., formed partly by an island, is a sheltered, spacious harbour, capable of admitting the largest vessels that navigate the lake, and defended by a fort which was repaired and remounted in 1864. The city is connected with the principal points of the Dominion and United States by the Grand Trunk, Great Western, Northern, T. Grey and Bruce, and T. and Nipissing railways. It has much the aspect of an English town, and in spite of its low, flat site, and somewhat commonplace vicinity, is a place of striking appearance, being finely laid out, with its streets, laid with tramways, crossing each other at right angles. King Street, the great promenade, runs parallel with the bay, and is intersected by Yonge Street, the second most important thoroughfare. The Esplanade, facing the bay, with its lines of quays and parallel lines of railway, is a great business centre. It is adorned with several good parks, including the Horticultural Gardens and the well-wooded University Park, with its beautiful monument to the volunteers who fell at Ridgeway. Among the principal buildings are the University, completed in 1859; the cathedral of St. James, begun in 1852, with a spire 316 feet high; the cathedral of St. Michael (Roman Catholic); the Osgood Hall, seat of the superior courts; the City Hall, the Opera-house, Post-office, &c. In all, T. has 58 churches, many of which have handsome spires; and as the educational centre of Upper Canada, its teaching institutions comprise, besides the University and University College (separated from the University 1853), a provincial normal school, colleges of physicians and technology, a school of medicine, St. Michael's College, 101 grammar-schools, &c. The University, opened in 1843, has some 250 students. T. has an asylum for the insane, with accommodation for 700, a city hospital, two houses for unprotected children, an orphan asylum (Protestant), a house of providence (Roman Catholic), and various minor charities. It publishes 4 daily and 17 weekly newspapers, besides 1 quarterly, 11 monthly, and 4 bi-monthly periodicals. An extensive manufacturing industry is represented by foundries, flour-mills, tanneries, breweries, boot and shoe stores, car-shops, lumber-yards, furniture-factories, &c. Within a short distance of T. are some of the most valuable and easily-wrought iron ores in the country, and mineral coal from the mines of Pennsylvania and Ohio can be offered in T. at a moderate price. The advantages thus afforded for smelting, and the proximity of and easy access to the United States market, were sufficient to induce a large English company to transfer its business-plant thither in January 1879. In 1871 the value of manufactures in T. was estimated at $13,686,093. During the open season the harbour is visited daily by the magnificent lake steamers from Montreal and other ports. For the year ending 30th June 1875 the exports (lumber, flour, wheat, cattle, prepared meats, &c.) amounted in value to $14,716,824, and an imperfect return of imports to $2,000,000. A firm of T. is negotiating (February 1879) with the British Government for the supply of the troops in Cyprus and Gibraltar with beef and mutton. In 1875 the temperature in the shade ranged from 10·2 F. in February to 66·6 in July, and the rainfall for the year amounted to 18·98 inches. Pop. (1861) 44,821, (1871) 56,092. T. returns two members to the provincial parliament, and two to the Dominion House of Commons. The name T. is supposed to be of Indian origin, but is of unknown meaning. The town, founded by General Simcoe in 1794, bore the name of York till 1834, when it was incorporated as a city. The capital of Upper Canada till 1841, and the seat of the united government alternately with Quebec from 1849 till 1858, it has been the capital of Ontario since 1867.

Torpe'do (*Torpedo*), the name given to species of *Elasmobranchiate* fishes belonging to the family *Torpedinidæ*. In this group the body is rounded and blunt-shaped in front, the back convex and unarmed, and the tail-fin triangular. The teeth are pointed, and the breathing apertures are serrated. The *T. vulgaris* is known as the Electric Ray and Cramp-fish. It is one of the electrical fishes, and can give very powerful shocks. The *electrical organs* consist of two honeycomb-like masses placed in the sides of the head. Each organ is made up of vertical gelatinous plates, separated by membranous partitions, and richly supplied with nervous filaments from the eighth pair of nerves. This arrangement of parts presents a close resemblance to a voltaic battery. The production of electricity is effected by the conversion of nervous energy into electricity by these specialised organs,

very much as nerve-force is converted into motion by muscular tissue. The electrical shocks decrease in violence after each emission of electricity, thus showing that the expenditure of nervous power diminishes the electrical force.

Torpe'do, a submerged military mine used in war for the purpose of destroying vessels belonging to an enemy. The name was first given by Robert Fulton, the American, to maritime defences invented by him, and which he successively offered to the French, British, and American Governments without success, their use being thought by the public of his time little short of diabolical. His system included four classes of torpedoes, viz.: (1) Buoyant mines, anchored and exploded by contact with the enemy's hull; (2) Line torpedoes, destined to be set adrift and fouled by the cables of the hostile fleet at anchor; (3) Harpoon torpedoes, to be discharged from guns by clockwork; (4) Block-ship torpedoes, to be carried on projecting booms and exploded by contact with the enemy. All those devices, except the third, are included in an improved form in the modern system. To another American, Samuel Colt (the inventor of Colt's revolvers), we are indebted for the introduction of electricity as an igniting agent. During the war between the allied Powers and Russia in 1855, Sebastopol, Cronstadt, and other Russian ports were protected by torpedoes or submarine mines designed by Professor Jacobi, but no serious damage was done by them, the charge of powder (about 9 lbs.) being too small. The fuse consisted of a small bottle of sulphuric acid embedded in a mixture of potassium, chlorate, and sugar, the breaking of the bottle by contact with the vessel effecting ignition. In the Franco-Austrian war of 1859, Colonel von Ebner designed an elaborate system of electrical mines for the defence of Venice, but no opportunity occurred of putting it to the test. The first occasion on which torpedoes were used on a grand scale was the Civil War in America. The Confederates had a large seaboard and many positions assailable by rivers to defend, and were altogether destitute of a fleet. They therefore established a torpedo factory at Richmond, from which hundreds of these deadly engines issued forth to commit terrible havoc upon the enemy. The Federals thereupon took retaliatory measures of the same kind. During the war seven ironclads, eleven wooden men-of-war, six army transports, and many smaller vessels belonging to the United States, were destroyed by torpedoes, while the Confederates lost three ironclads from their own mines, and one from the operations of the enemy. The Confederate system embraced—(1) Stationary torpedoes or sea-mines; (2) Automatic drifting torpedoes; (3) Infernal machines; (4) Offensive spar torpedoes; and (5) Submarine boats. The *stationary torpedoes* included simple frame torpedoes. Each shell of these contained 25 lbs. of gunpowder to which a fuze similar to that used by Professor Jacobi was attached, protected by a thin lead cap to be crushed by the hostile vessel. The swaying boom and turtle torpedoes were improvements, having a larger charge and being free to move in the water. General Rains devised an exceedingly sensitive fuze of fulminating mercury and fulminating silver which he used in his barrel or conical-shaped torpedoes. Electrical mines with enormous charges of powder worked by an operator on shore were also used by the Confederates. The *Commodore Jones* was destroyed on the James River, May 6, 1864, by a T. of this type. *Automatic drifting torpedoes* were used for rivers where the current could be depended on to carry them down to the hostile fleet, and as a protection against them, nettings were placed round ships at anchor. *Infernal machines* were explosives intended to be smuggled on board the enemy's vessels, and there to effect destruction. Their use was not legitimate in war. Such was the 'coal T.,' a metal case containing several pounds of gunpowder cast and coloured like a piece of coal—when thrown into a furnace the explosion of the boiler followed. The 'horological T.' contained a charge of powder to be fired after a fixed time by a clockwork arrangement. *Offensive Spar Torpedoes:* Outrigged spars from 20 to 30 feet in length were used for these. The Confederates used copper cigar-shaped torpedoes about 35 feet long charged with 50 lbs. of gunpowder, and driven by engines at a speed of about seven knots per hour. Under cover of night these boats approached the hostile fleet. Others were carried in ordinary steam launches. Thus Lieutenant Cushing blew up the *Albemarle*. The *Submarine boats* used by the Confederates were not found to work well. They were designed to pass under the enemy, dragging a floating T. to explode on contact with the enemy's hull. One boat of this kind was constructed of boiler iron, 35 feet long, propelled by hand at four knots an hour, and could remain submerged at any depth for half an hour. She had a crew of nine men. In her preliminary trials she sank three times and drowned twenty-three men. Eventually she sank a United States sloop and herself at the same time. Since the American war, although wonderful improvements have been made in torpedoes, they have not been tried on a very extended scale. During the Paraguayan war a fine Brazilian ironclad was sunk by two anchored torpedoes with sulphuric-acid fuzes. Torpedoes guarded the German ports during the war of 1870-71, and effectually scared the French navy. The *Ball of Verdun* was invented during this struggle; viz., a large iron ball, 3 feet in diameter, charged with gunpowder and provided with a clock-work train arranged to ignite the ball by the firing of a pistol after a certain time. The centre of figure and the centre of gravity being coincident, and the ball being little heavier than water, it was able to roll along the deepest part of the current of a river, thus eluding detection. Similar balls were used during the siege of Paris to convey letters into the capital. In the first stages of the Russo-Turkish wars there were several encounters between ships of war and T. vessels. On the night of May 25, 1877, Lieutenants Dubasoff and Shestakoff in the most daring manner steered a couple of steam launches into the centre of the Turkish flotilla on the Danube, and succeeded in blowing up a monitor. These vessels were painted black and screened with iron, having each two torpedoes attached to the end of a long spar projected from the bow. A long light chain was attached to the torpedoes, and they were connected with the boat by electric wire. On coming to the bow of the monitor, the T. was dropped from the spar and attached by the chain to a rope suspended from the bow. The steam launches shot away to the full length of the electric wire, and on the current carrying the torpedoes against the bottom of the ship, the officers in command of the launches effected the explosion by firing an electric battery. Notwithstanding that the machinery of the T. launches was almost noiseless, the attack could scarcely have succeeded had the Turks had efficient lighting and watching. On 1st July 1877 a Turkish monitor successfully fought four T. boats, the boats failing to strike her with their torpedoes.

The torpedoes in use at the present day may be broadly divided into defensive and offensive torpedoes. The former, which are simply submarine mines, are essential for harbour defence. They differ but little from mines used in land fortifications, and being worked from shore are usually managed by military engineers. For the charge gun-cotton is now more common than gunpowder, as it occupies less space and is impervious to wet, while electricity is the usual igniting agent. The mines are usually arranged to be fired at will or automatically by the touch of the vessel. In the latter case a circuit-closer or circuit-breaker is employed. The mines are retained in their positions by sinkers, of which there are two patterns, the *saddle* and the *mushroom*. The core of the connecting cable consists of a strand conductor of four copper wires, tinned, with a case of vulcanised indiarubber. As regards offensive torpedoes much has been done of late years, but the utmost secrecy is observed among different nations as to discoveries in this important branch of warfare, particularly in the mechanical details and the manner of adjusting and fitting the several manufactured parts. Some offensive torpedoes require the skill and daring of a sailor to move them into a position and explode them at a destructive range; others, such as fish torpedoes, may be operated either from land or shipboard. Among the principal known forms of offensive T. are the offensive spar T., as previously described, the Harvey T., and the Whitehead T. Many spar torpedoes have been constructed for the English navy, and they will always be popular among sailors on account of the dashing courage and adventurous daring which they require. Some have considerable armaments, and are capable of developing a speed of 18 miles, being propelled by noiseless machinery. The *Harvey T.* was invented by Captain Harvey of the Royal Navy. It was successfully tested at official experiments at Portsmouth in 1870. The largest patterns contain a charge of about 100 lbs. of gun-cotton or dynamite in a copper vessel encased in wood, about 4 or 5 feet long, 2 feet deep, and 6 inches wide, ballasted so as to ride vertically in the water. The vessel is attached to a fast steamer by wire-rope, and the T. is designed

to strike the hull of the enemy by means of breaks and levers. The first experiments with the *Whitehead T.* were made by Robert Whitehead at his celebrated factory at Fiume, Austria, upon the suggestions of Captain Luppis of the Austrian navy. The torpedoes of this kind recently on view at Woolwich Arsenal were in long cigar-shaped cases of thin steel, built in sections well screwed together, about 17 feet long and 15 inches wide in the widest part. The first compartment contains a charge of gun-cotton (in some 360 lbs.), to be fired by the forcing of a roughened pin into a cap of fulminate on contact with any object. The second compartment contains Mr. Whitehead's secret contrivance, giving the operator control over the machine, so that he can make it run at any regulated depth. The next section is a reservoir for compressed air, then comes the machinery, and last of all the screw and rudders. A full description of this T. will be found in the *Illustrated London News* of May 18, 1878. It is fired from a ship through an impulse tube, and when it finishes its run it rises to the surface of the water, being towed back by a boat. Experiments on a large scale with the Whitehead took place at Portsmouth on March 2, 1878, in presence of eighty members of Parliament. The torpedoes sped straight as an arrow, with great nicety as to the required depth, at a speed of from 12 to 14 knots. Several Whiteheads captured from the Russians recently lay at Constantinople. Their speed was estimated at 27 knots an hour for 200 yards, and the full distance of their run was 1800 yards. In the words of Lord Charles Beresford (speech in House of Commons, March 19, 1877), the Whitehead T. can do anything but speak. It can be set to explode on contact, or after a definite time, or within 1000 yards of the hostile object. It could make a hole in any vessel of 75 feet area, and sink any ship afloat. The invention of the *Fish T.*, steered by electricity, has superseded the use of submarine boats. It was patented by Colonel Ballard, R.E., in August 1870, and has been elaborated by inventors of various nationalities. In consists of a boat of the Whitehead class, which unwinds a coil of insulated wire, through which an electric current can be passed from a battery on shore or shipboard at will to certain electro-magnets. The motion of the fish is under the perfect control of the manipulators, and it may be propelled by compressed air, steam, or liquefied carbonic acid. The manufacture of torpedoes for the British Government is carried on at the Royal Laboratory, Woolwich, and qualified instructors are attached to the navy to teach their manipulation to the sailors.

Modern ironclads are such enormously costly structures, that naturally the utmost ingenuity has been exerted to discover some means of defence which could make them safe from these insidious and deadly attacks. Wire nettings are somewhat cumbersome, as they hinder the vessel's speed, while a Whitehead T. will go through half an inch of netting. It has been found that the explosion of a mine will burst or destroy all fixed submarine torpedoes within a radius of 100 feet. In the experiments at Portsmouth on March 2, 1878, it was shown how such mines could be fired by electricity from steam launches, without a soul on board, acted on by an operator in another vessel. During the critical months of 1878, while the British fleet lay in the Sea of Marmora, and when war might any day have broken out between Great Britain and Russia, extraordinary vigilance was shown by Admiral Hornby to guard his ships against night attacks. Electric lights from the tops turned the immediate surroundings of the ships from night into day, while steam launches, with 9-pounders, and with armed crews, prowled round them all night. Outposts were established at the outlets on the entrance to the bay, and the Gatling guns were kept constantly loaded. Outrigged spars and wire nettings also formed part of the defence. In February 1879 the Admiralty despatched men to various ports in the kingdom and in India to give instruction in T. practice. See *Submarine Warfare, Offensive and Defensive* (New York 1869), *Des Explosions au sein de l'eau* and *Études sur les Effets des Explosions sous-marines* in *Revue Maritimes* (Par. 1877), Ehrenkrook's *Fischtorpedos* (Berl. 1878), and *Geschichte der Seeminen und T.* (Berl. 1878).

Tor'quay, a celebrated English watering-place in Devonshire, beautifully situated on the N. side of spacious Tor Bay, 23 miles S. of Exeter, and 210 from London by rail. It is partly built in the coves and the narrow valleys that run inland to the coombes and plateaux of Dartmoor, partly on the terraces that line the great limestone cliffs, and from the sea it presents a singularly picturesque appearance, its white houses gleaming from out luxuriant foliage, with the dark background of the upland Tors. As a watering-place it became known only about the beginning of the century, but it soon acquired a European celebrity, and has increased with unusual rapidity. Tormohun is the mother parish, and Torre Church is the only church not of modern date. Of the great Premonstratension house of Tor Abbey, founded in 1196 by William Lord Brewer, there are some interesting remains connected with the Tor Abbey of modern times. Under the modern house are some crypts, the character of which was first ascertained during some restoration works in 1874. A museum, in Venetian-Gothic style, was erected 1874–75, at a cost of £2300, and an aquarium and winter-garden was projected in 1876, at a cost of £30,000. A new pier, built by Sir Lawrence Palk, is causing T. rapidly to rise into importance as a yachting station. The great attraction of T. is, however, its fine climate. With a mean winter temperature of 44°, or 3° above that of Greenwich, it has a summer average of 1° below Greenwich, or 55°. Many of the inhabitants are employed at Blacklee's Royal Marble Works, St. Mary Church, in preparing the famous Devonshire marbles, of which Petitor furnishes a richly-varied supply; the fossil varieties of these marbles are known commonly as madrepore. At T. is made the finest terra-cotta ware now produced, and the works of the Watcombe and T. companies are open to visitors. Pop. (1801) 1000, (1871) 21,657; (1879) estimated at 26,000. Torbay was the landing-place of William of Orange in 1688. In the vicinity are Kent's Cavern (q. v.), and Brixham Cave, discovered in 1851, both of which are rich in prehistoric remains. Kent's Cavern has been undergoing systematic exploration for several years on behalf of the British Association by Messrs. Vivian and Pengelly. See Thomson's *T. Past and Present* (Lond. 1877). The latest and most complete account of the town is given in J. T. White's *History of T.* (1878).

Torque (Lat. *torquere*, 'to twist'), an ornament for the neck worn by the barbaric nations of antiquity, and formed of wires of gold or other metal twisted into a rope-like shape usually terminated by clasps, or of small rings linked together like a chain. Among certain Asiatic nations it served as a sign of distinction, while Celtic peoples regarded it as a national ornament. The Romans, who adopted it from the Gauls, used it as a reward for valour. The accompanying figure represents a bronze T. found on the Quantock Hills in Somersetshire. A neck ornament, in which the primitive form of the T. is retained, is still worn in some parts of India.


Torque.

Torr'e del Gre'co, a town in the province of Naples, Italy, on the Gulf of Naples, 7½ miles S.E. of Naples by rail. It lies at the foot of Mount Vesuvius, on the lava stream of 1631. There are fisheries, and manufactures of coral articles and of wine. In 1875, 234 vessels of 14,717 tons entered and cleared. Pop. (1874) 18,950. Founded by the Emperor Friedrich II., T. suffered severely from earthquakes and eruptions in 1737, 1794, 1856, and 1861, yet the inhabitants have always rebuilt their homes on the same spot.

Torr'e dell' Annunzia'ta, a town of the province of Naples, Italy, on the Bay of Naples, 12½ miles S.E. of Naples by rail. It has manufactures of macaroni, paper, and weapons; also fisheries. In 1875, 571 ships of 66,238 tons burden entered and cleared this port. Pop. (1874) 15,321.

Torr'es-Strait, discovered by Torres in 1606, separates Australia from New Guinea, and is 200 miles long, with a minimum breadth of 80 miles, and a depth varying from 48 to 120 feet. Numberless sandbanks, coral reefs, and islands, together with swift tides and fierce squalls, make its navigation dangerous, especially to sailing-vessels. The largest islands measure from 4 to 35 miles in circumference, and are of volcanic formation, lofty and wooded.

Torres-Ve dras, a small town of Portugal, Estremadura, on the Sizandro, 30 miles N. of Lisbon, celebrated in connection with the famous lines of defence behind which Wellington retired after the vain effort to hold the Portuguese frontier against the

French. The outermost of the lines stretched 29 miles from Alhambra on the Tagus to the sea at the mouth of the Sizandro; the second, from 6 to 10 miles behind, from Quintella on the Tagus to the mouth of the St. Lorenza, a distance of 24 miles. The third line, much shorter, lay S.W. of Lisbon, at the very mouth of the Tagus, and was meant as a cover if embarkation were necessary. The whole lines consisted of 152 redoubts, with 534 pieces of ordnance and 34,125 men. The 'great work at Monte Agraça' had a perimeter of 2435 feet, an armament of 25 guns, and a garrison of 1590 infantry. The Allies entered the retreat which the foresight of Wellington had provided in October 1810, and held the French at bay till March 1811. The enemy then retired, and Wellington issued on his career as the liberator of the Peninsula.

Torricell'i, Evangelis'ta, an Italian mathematician and physicist, was born at Piancaldoli, in the Romagna, October 15, 1608, and came in 1625 to Rome, where he studied geometry under Castelli, and subsequently acted as amanuensis to Galileo, after whose death he was appointed by the Archduke Ferdinand II. professor of mathematics and philosophy at Florence, where he died October 25, 1647. T. published *Opera Geometrica* (Flor. 1644), but is chiefly known for the invention of the mercurial barometer (1643). The space above the mercury, which is filled with mercury vapour, is frequently called the *Torricellian vacuum*. See BAROMETER.

Torr'ington, a market-town of N. Devon, 6 miles S.S.E. of Bideford, crowns a hill-top on the right bank of the Torridge, and has a church which, blown up during Fairfax's attack in 1645, was thoroughly restored (1863). T. also contains a townhall, market-house (1842), literary institute, &c.; and besides brewing and tanning, manufactures gloves and fancy boxes. Pop. (1871) 3529. T. played an important part in the Great Rebellion, and gave the title of Earl to General Monk, who was born in the neighbourhood.

Torshok', a town of Russia, government of Tver, on the Twerza, 20½ miles E.S.E. of Oshtashkov by rail. It is one of the oldest towns in Russia, and was formerly fortified. It has a fine cathedral and twenty-two other churches, and carries on manufactures of wax, leather, gold and silver embroideries, besides a trade in corn. Pop. (1871, *St. Petersb. Cal.* 1878) 12,910.

Tor'sion, in mathematics, is the rate at which the osculating plane rotates per unit of length of the curve, where by *osculating plane* is meant the plane containing the tangent and the radius of curvature. A plane curve has no tortuosity; hence a *tortuous* curve, called by some a curve of double curvature, cannot lie in a plane. In mechanics the term is applied to the force with which a body, such as a thread, wire, or slender rod of metal, resists a twist. Experiment shows that within certain limits the T. is proportional to the angle through which the body is twisted, and that these limits depend upon the elasticity of the material. If a metallic wire stretched by a weight is twisted through a moderate angle, and then left to itself, it will begin to untwist and then to retwist, and so on in a series of perfectly isochronous and regular oscillations. The measure of the T. depends on the time of oscillation.

The *T. balance* takes advantage of these properties to measure small forces; and for this purpose was used by its inventor, Coulomb, who not only investigated the laws of T., but established by its means the fundamental laws of electric and magnetic attractions and repulsions. A similar apparatus has been used by Cavendish, Baily, and others in estimating the density of the earth.

Tor'sion is a method employed in surgery for arresting hæmorrhage from small arteries. The bleeding vessel is seized by a pair of forceps, drawn out for about a quarter of an inch, and then twisted round several times till it cannot untwist itself. T. is much preferable to ligature when small arteries are opened during an operation, as in the removal of a large tumour.

Torsk (*Brosmius vulgaris*), a Teleostean fish also known as the 'Tusk,' allied to the *Gadidæ* or cod, and found in the N. Atlantic. It has a small head, a long body, with a long and unbroken dorsal fin, an undivided tail, and a long anal fin. There is one *barbule* or tentacle under the chin. The colour is a dingy yellow above and white below. The T. lives in deep water. It is caught in large quantities, and when salted and dried is one of the most savoury of stockfish. The chief T. fisheries are off the Faroe and Shetland Islands, off the Norwegian coasts, and on the shores of Iceland.

Tor'so (Ital. 'a trunk'), a name in art applied to a statue of which only the trunk remains, as the famous 'T. of Hercules.'

Tor'stensohn, Lennart, a celebrated Swedish general in the Thirty Years' War, born at Torstena, August 17, 1603, became in his fifteenth year page to Gustaf Adolf, and in 1630, as captain of the bodyguard, accompanied the king to Germany, where he highly distinguished himself in the battle on the Lech, April 5, 1632. He was taken prisoner before Nürnberg, August 24, 1632, and subjected to rigorous confinement for six months in a subterranean dungeon at Ingolstadt by Maximilian of Bavaria, which shattered his health and obliged him to return to Sweden. In 1635 he returned to Germany, and took part in most of the battles under Bernhard of Weimar and Baner, the successors of Gustaf. In 1639 he returned to Sweden, but on the death of Baner in 1641 he became commander-in-chief of the Swedish army. After recruiting his army, he entered Schlesien through Sachsen, took Glogau and Schweidnitz, turned into Moravia and captured Olmütz. Obliged to retreat into Sachsen before the Archduke Leopold and Piccolomini, he turned upon his pursuers and inflicted a severe defeat at Breitenfeld, November 2, 1642. In the spring of 1643 he threatened Prague, and relieved the beleaguered Olmütz. In consequence of Denmark's declaration of war against Sweden, in December he burst into Denmark, and in six weeks subjugated the whole peninsula, with the exception of the fortresses Rendsburg and Glückstadt. After defeating the Austrian general Gallas at Jüterbok, November 23, 1644, he returned into Bohemia, defeated Katzfeld at Jankau, March 6, 1645, overran Moravia, pressed forward to the Danube, and demolished the fortifications on the Wolfsbrücke before Vienna. He now laid siege to Brünn, but its obstinate defence, and a pestilence among his troops, obliged him to retreat into Bohemia. Exhausted by sickness, he was obliged to leave the command to General Wrangel, and return to Sweden. He was made Count of Ortala by Christina in 1647, and died at Stockholm, April 7, 1651.

Tor'toise, the name given to various genera of *Chelonian Reptilia* belonging to the families *Testudinidæ* and *Emydidæ*. In the T. the limbs, unlike those of the Turtle (q. v.), are adapted for walking. The toes are distinct and provided with nails. The *shell* or *carapace* is strongly convex and of square shape; and the head, limbs, and tail can be withdrawn into the shell. The food consists chiefly of vegetable matters. Of the T. the most familiar species is the *Testudo Græca* or European T., found in S. Europe. It attains a length of from 6 to 8 or 12 inches, hybernates during winter, and lives to a great age—sometimes as much as 100 years. This is the kind hawked in the streets. The *Testudo Indica* or Indian T. is over 3 feet in length. It inhabits the Seychelles and Galapagos Islands; both its flesh and eggs are esteemed delicacies. The Sopher (*T. Sopher*) or Pllungofa T. is a native of America, attains a length of 13 inches, and is of a brownish-yellow colour marked with dark brown. The genus *Pyxis* includes the *P. arachnoides* of India and Madagascar, notable for its ability to close its shell by a kind of movable lid. The Terrapin includes the chicken T. (*Emys reticularia*) and the lettered T. (*E. scripta*). The wood T. belongs to the genus *Kinosternon*, and is common in N. America; the box T. (*Cistudo Carolina*) is another American species which has the power of closing its shell at will. In the Sewalik hills of India and in Tertiary deposits the fossil remains of a giant T. (*Colossochelys Atlas*) have been found. This animal attained a length of 18 or 20 feet, and may possibly have survived the human period.

Tor'toise-shell, the name given to the epidermal and horny plates (representing skin-structures) which cover the back of the *Chelonia imbricata*—the Hawksbill Turtle. T. should thus more properly be called 'turtle-shell.' These plates are overlapping scales, and may attain a length of over 12 inches. They are susceptible of a high polish, and in this state, and when thinned, exhibit the variations of colour familiarly seen in T. This substance is remarkably ductile under heat. It is used for making combs and like articles. The plates are taken off the back of the animal, which is then allowed to escape, the subsequent growth of the plates, however, being imperfect.

Torto'la. See VIRGIN ISLANDS.

Torto'na (anc. *Dertona*), a town in N. Italy, province of Alessandria, on the Scrivia, a feeder of the Po, 13 miles E. of Alessandria by rail. Its old *duomo* (a Jewish synagogue till the time of Constantine) was destroyed accidentally by gunpowder in 1609; that erected in 1575 contains several fine pictures, and a grand sarcophagus with Greek and Latin inscriptions. T. has a rich library (chiefly ecclesiastical), a large theatre, and industries in silk-reeling and the making of coarse cottons. Pop. (1874) 13.504. T. was a free republic in the Middle Ages.

Torto'sa (anc. *Orthosia*), a town of Spain, province of Tarragona, on the left bank of the Ebro, 22 miles from its mouth, and 85 S.W. of Barcelona by rail. It manufactures cottons, linens, glass, soap, pottery, &c., and has sturgeon and lamprey fisheries. The Ebro is here crossed by a floating bridge, and T. is defended by three forts. Pop. 20,600.

Tortu'gas (Sp. *tortuga*, 'a tortoise'), or **Dry Tortugas**, a group of ten islets or keys, belonging to Florida, U.S., 40 miles W. of the most westerly of the Florida Keys. They are of coral formation, low, barren, and partly covered with mangroves. On Loggerhead Key stands a brick lighthouse 150 feet high, with a fixed white dioptric light of the first order. At Dry Tortugas Harbour a smaller light stands inside Fort Jefferson, an important fortification on Grand Key. The islets served as a place of imprisonment for persons under sentence by courts-martial during the Civil War, and for several criminals concerned in the murder of President Lincoln.

Tor'ture (Lat. *torqueo*, 'I twist'), in the republics of Athens and Rome, could only be inflicted on slaves, whose evidence otherwise was inadmissible; but by the Roman emperors it was extended to freemen—even senators and equites—and thus became a recognised part of Justinian's code. Thence in the Middle Ages it was employed by nearly every European state; in England being reluctantly adopted by Edward II. against the Templars (1310). Introduced under Henry VI. by the Duke of Exeter, the Rack (q. v.) was frequently applied to supposed witches, and to both Marian and Elizabethan sufferers for conscience' sake; the last instance of its use was in 1640, when one Archer was racked for attacking the archbishop's palace. T., however, except in the case of the Peine Forte et Dure (q. v.), was never more than a Crown prerogative, and was not formally recognised by English law, as was the Boot (q. v.) by Scotch. Upon the Continent it was for many centuries employed against criminals and political offenders by the various states, by the Church, and especially the Inquisition (q. v.), against heretics. It continued in use down to the close of last century, being abolished in France (1789), Germany (1754), Austria (1776), Sweden (1786), &c.; but such abolition was not always effectual, since in Hungary forty-eight gipsies were racked till they admitted a wholly unfounded charge of cannibalism (1782), and even in this 19th c. Ferdinand VII. of Naples submitted his prisoners to the 'question.' See Howard, *State of Prisons* (new ed. 1780); Mittermaier, *Das Deutsche Strafverfahren* (4th ed. Heidel. 1847); and Jardine, *Reading on the Use of T. in England* (Lond. 1837).

To'ry. See WHIG and TORY.

Tot'nes, a market-town of Devon, on the navigable Dart, 23¾ miles N.W. of Plymouth by rail, is an ancient place, with 'rows,' like those of Chester, lining the older portions of its one main street. Two gateways, a Norman keep crowning a lofty mound, a quaint guildhall, and the Perpendicular church of St. Mary (1432; restored by Sir G. G. Scott, 1874), with a fine stone screen and noble tower, make up the chief antiquities of T. Other buildings are the Church Walk or exchange, assembly rooms, the market-house (1846), and a grammar-school (founded 1554), while on the 'Plains' near the river a granite obelisk was erected (1864) as a memorial to the Australian explorer Wells. T. publishes one weekly newspaper, and drives an important trade in agricultural products. Pop. (1871) 4073.

Tou'can (*Rhamphastos*), a genus of *Scansorial* birds, forming the type of a family (*Rhamphastidæ*) in which the bill is enormously developed. The mandibles are, however, hollow, and the substance of this great bill being largely composed of air-cells renders the structure much lighter than it would otherwise be. The tongue is very long, and has notched or serrated edges, while in some forms distinct side-processes may be developed. The nostrils are borne at the base of the bill, and the wings are short and rounded, and have their fifth quill longest. The tail is short and even, and the claws are strongly made. The T. inhabits S. America. The *Rhamphastos ariel* is the common species; it attains a length of two feet, the bill measuring about eight inches in length. The general colour is a deep black, the throat and cheeks are white, and the breast yellow. An orange ring surrounds the eye. The flight of the bird is quick and agile. It moves about among the trees by a series of skipping jumps. The voice is harsh; and the cry of one species, resembling the word 'Toucan,' has given origin to the name. The food consists chiefly of vegetable matters, but at the breeding season the T. eats large quantities of termites or white ants. A domesticated specimen has been known to eat mice and young birds. Numerous species have been described, the different forms exhibiting great variation in the colouring of the bill.

Touch, the most widely diffused of senses, through which we gain information respecting the common properties of the material world and its objects. All parts of the body endowed with common Sensibility (q. v.) are seats of this sense, and the nerves which confer upon parts the sense of T. are those which confer powers of ordinary sensation on the different parts of the body—these nerve-fibres arising from the *posterior roots* of the spinal nerves, and the sensory nerves arising from the brain (see NERVE). The sense of T. is subserved in various ways in lower life. In fishes the *lateral line* is the seat of this sense. In birds the *cere* is believed to be the most sensitive part of the body in respect of the exercise of this sense. In quadrupeds, the 'whiskers' in the lions and cats generally; or the general body-surface and wing-membrane, as in bats, may subserve this sense. In insects, crustaceans, centipedes, &c., the *antennæ* or feelers are the organs of T., whilst in spiders the *palpi* of the mouth represents the antennæ of the insect. The tentacles of the snails, whelks, and their neighbours; the 'arms' of cuttlefishes; the tentacles of sea-anemones, corals, zoophytes, &c.; and even the unspecialised but sensitive protoplasm of *Protozoa* (q. v): each and all exercise this sense in greater or less perfection. Even in plants this most widely-diffused sense is represented. The sensitive hairs on the leaves of *Dionæa* (q. v.), and the equally sensitive leaves of the *Mimosæ* or Sensitive Plants, illustrate the nature and prevalence of sensation in plant-life. The dictum of Goethe, that all the senses are but modifications of T., seems to rest on a philosophical basis, since material contact of light-rays with the eye, or of sound-waves with the ear, is necessary for the production of sensations of sight and hearing respectively. Modifications of the sense of T. are numerous. The sensation of heat, pricking, and other states exemplify such modifications. The sense of pressure indicates a slight exercise of the sense of T. over a relatively greater area, and at a great depth; that of pricking arises from an intense affection of nerves over a small extent and at a limited depth. It is alleged by some physiologists that common sensation and tactile or special sensibility are exercised by different nerves or sets of nerve-fibres. This is Sieveking's view, and also that of Schiff and Broun-Séquard. The conditions for the exercise of the sense of T. depend, amongst other things, upon the perfection of the cutaneous or skin-circulation. A benumbed finger is useless for touch. Nor must the force of habit and the influence of education be lost sight of in connection with the perfection of this sense. The phrase *tactus eruditus* bears a very succinct physiological meaning, as seen in the deft touch of the artist, the engraver, or in that of the surgeon and physician. There can be little doubt that acuteness of T. depends to a great extent upon the nervous supply of any given part of the body. The sense of T. is liable to physiological derangement, as well as to abnormal action. When the fore and middle fingers are crossed, and a marble rolled between them, the sensations which result are those of two marbles, not of one. And in the matter of *after-sensations*, this sense is capable of being vividly perpetuated by memory, the remembrance of a pain or of a pleasurable sensation being an every-day feature of human life.

Touch'stone, or **Lyd'ian Stone,** a siliceous rock or 'glinty slate' which has long been used as a test or 'touchstone' for gold, the purity of the metal being judged of from the streak which it leaves upon the stone.

Touch'wood is a soft, white substance into which wood is converted by the action of such fungi as *Polyporus squamosus.* It is easily ignited, and continues to burn for a long time like

tinder. When highly impregnated with the fungus-spawn, the mass has been observed to be luminous.

Toul, a fortified town of France, department of Meurthe-et-Moselle, on the left bank of the Moselle, 15 miles W. of Nancy by rail. Its chief buildings are the celebrated Gothic cathedral of St. Étienne (965-1496), and the part Gothic, part Romanesque, collegiate church of St. Genoult. T. manufactures lace, calicoes, tiles, fayence, and vinegar. Pop. (1876) 10,085. During the Franco-German war, T. surrendered after three days' bombardment, 23d September 1870.

Toulon', a French naval arsenal of the first class, department of Var, beautifully situated on a deep inlet of the Mediterranean, formed by the peninsula of Sépet, 40 miles S.E. of Marseille by rail. It is built at the foot of the Pharon Hills, which protect the city on the N., and are partly covered with fine forests. Defended by a strong citadel, girt with a double-bastioned wall, and surrounded by some twelve forts and redoubts, it is, next to Brest and Cherbourg, the principal naval station of France. The town is divided into old and new parts, the former quaint and dingy, the latter containing the public buildings erected by Louis XIV. and several spacious squares, as the Champs de Battaile, Puget, and St. Pierre. Among the chief buildings are the Hôtel de Ville with cariatides by Puget, the Hôtel de l'Intendance, the cathedral of St. Marie-Majeure, dating from the 11th c., but greatly altered, a naval hospital erected by Louis XIV., the hospital of St. Mandrier, on the Sépet, a public library of 15,000 vols. and 8500 MSS., and a handsome theatre. The Mourillon tower, built 1848, in six *étages*, commands a magnificent view. The Bagne for convicts, established by Colbert in 1682, was removed in 1872. The *port militaire*, one of the largest in Europe, comprises the old Darsa, formed under Henri IV., the new under Louis XIV., and the Darsa of Castigneau; three repairing docks and three arsenals—(1) the *arsenal maritime*, built by Vauban, with a general magazine, a cordage factory, a foundry, a naval museum, a park of artillery, and an armoury; (2) that of Castigneau (area 17 hectares), with bakeries, copper-works, forges, &c.; (3) that of Mourillon, with steam saw-mills, covered slips, and large fosses for the conservation of timber. The naval port, the equipment of which is singularly complete, and the cost of which amounted to upwards of 160 million francs, is separated from the roadstead by hollow bomb-proof moles, lined with batteries. A great number of the inhabitants (some 10,000) are employed in the arsenal works, and of recent years there has sprung up a considerable trade with Algeria. The *port marchand* was entered (1876) by 80 sea-going vessels of 15,173 tons, and by about 350 coasters, of 19,500 tons. T. has an agreeable climate; at its Jardin des Plantes palms grow in the open air. Pop. (1876) 70,509. T. is said to have been founded by a Roman soldier, Telo Martius, and was known as *Telo* in the 4th c. It was destroyed by the Arabs in 889, and again in the 12th c., but in the 16th c. it had become a stronghold of some importance. On 27th August 1793 it was taken by the English, who were forced on 19th December following to surrender it to the Republicans after firing the shipping. Napoleon, a simple officer of the *Hommes sans peur*, then first evinced his genius for war.

Toulouse', an important city of France, capital of Haute-Garonne, in a broad, fertile plain, on the right bank of the Garonne, at the junction of the canals Du Midi and De Brienne, and the Canal-Lateral, 160 miles S.E. of Bordeaux by rail. With its fine skies and superb southern prospect stretching away to the grand outline of the Pyrenees, the town as a whole has no great architectural character, although it contains many fine buildings, luxuriant gardens, shady boulevards, spacious quays, and stately bridges. Among its public resorts are the Places du Capitole, de St.-Georges, des Carmes, and the Jardin des Plantes; the promenades, Jardin, Royal, Allées St. Michel, St. Étienne des Zéphyrs, des Soupirs, and the Grand Allée, are so many green links in the Grand Rond or Boulingrin. A stone bridge of six arches, 810 feet long, dating from the 16th c., and a modern suspension bridge, give access to the important suburb of St. Cyprien, on the S. side of the river. The houses are mainly built of brick, and the streets, excepting those of St. Cyprien, are in great part narrow and irregular. Of the public buildings the chief are the cathedral of St. Étienne, containing tombs of the Counts of Toulouse; St. Servin, one of the best specimens of Romanesque architecture in France, completed in the 15th c., with tower 63 metres high; the church Du Taur, of 13th c., with curious brick façade; the 13th c. Capitole, or town-hall, with its *avant-corps* adorned with eight marble columns; the old battlemented Collége de St. Raymond; the church of La Dalbade, with a portal ornamented with delightful Renaissance *motifs*; the Hôpital St. Jacques, rebuilt in the 18th c.; the arsenal, in an *enclos* of the Chartreux; the modern Hôtel de Ville (1750-60), designed by Cammas, with grand sculptures; the Palais de Justice, in front of which stands a bronze statue of Cujas by Valois. The Musée, formerly an Augustinian convent, contains a unique collection of objects of the Stone Age, some 5000 medals, and splendid cabinets of pictures and sculpture (forty marble busts of Roman emperors). The Public Library has 60,000 vols. and 700 MSS. The seat of an archbishop, T. has faculties of Catholic theology, of law, of science, and of letters, an École des Beaux Arts, a music conservatory, an academie de *jeux-floreaux* ('floral-games,' after the Troubadour contests), and various learned societies. The manufactures, which are important, comprise woollens, cottons, machinery, farm implements, candles, oil, oilcloth, soap, paper, &c. Besides transmitting 2,000,000 hectolitres of grain yearly, it carries on a large trade, chiefly at four annual markets, in wine, timber, Pyrenees marble, pâtés de foi gras, truffles, &c. T. is also the seat of a court for Haute-Garonne, Tarn, Tarn-et-Garonne, and Ariège, as well as the residence of the commander of the 12th Army Corps, and 34th Division. There are here military schools, arsenals, powder-factories, &c. Pop. (1876) 131,642. Originally the capital of the powerful Volcæ Tectosages, the town became the 'Palladian' *Tolosa* of Provincia, and a place of literary celebrity under the Romans. It was the chief town of the West Goths (from 412 A.D.), and on the division of the empire (817) fell into the hands of counts, who shook off their fealty about a century later. The 'county of T.' extended along the Garonne. T. was a celebrated seat of the Troubadours, and suffered severely in the fierce crusades which Simon de Montfort headed against the Albigenses (q. v.). The Parliament of T., though little known now except by the vile Calas (q. v.) decision, had a great reputation in its day. T. has frequently suffered by the floods of the Garonne, on the melting of the snow in the Pyrenees and Cevennes, but perhaps never more terribly than by those of June 1875. The rushing torrent swept away bridges, tore up railways, bore along houses, wrecked the suburb of St. Cyprien, drowned 300 souls, and left the plains of Garonne a desert. The loss was estimated officially at £4,000,000, but the total loss, direct and indirect, did not amount to less than £12,000,000. See Jourdan, *Panorama Historique de T.* (2d ed. Toul. 1877).

Toungu', the chief town of the district of the same name in British Burmah, on the right bank of the Sittang river, down which it exports timber and rice. Pop. (1872) 10,195. It was the capital of the Pegu dynasty, which attained great power in the 16th c.; and was chosen in 1858 for the exile of Behaudur Shah, the banished Mogul Emperor of Delhi, and is still the residence of his son.—The *district* of T. lies on the frontier N. of Rangoon and E. of Prome. Area 6354 sq. miles; pop. (1872) 86,166. It is the home of the aboriginal tribe of Karens (q. v.).

Tour'aco (*Turacus*), a genus of African birds belonging to the *Conirostral* division of the *Insessores* or perchers. The T. is allied to the plantain-eater, and has a short bill, the fourth, fifth, sixth, and seventh quills being longer than the others. The White-Crested T. (*Turacus albocristatus*) is the best-known form. It attains the size of a crow, is olive-green on its upper parts, the prominent crest being green with a white edge. The T. is wary and inquisitive. It inhabits trees, and runs quickly amongst the branches.

Touraine', a former province of France, bounded by Orléanais, Berri, Poitou, and Anjou, and now included in the department of Indre-et-Loire and a part of Vienne. It was celebrated for its fertility and known as the 'garden of France.' Since 941 it formed a separate countship, and fell in 1045 to the Counts of Anjou, next to the Plantagenets, and in 1203 to the French crown under Philippe II., Auguste. In 1360 it was made a duchy, and was granted to various French princes, but in 1584, on the death of Duke François d'Alençon, brother of Henri III., it was again united to the Crown. See Bourasse, *La T., son Histoire et ses Monuments* (Tours. 1855).

Tourcoing', a town of France, department of Nord, 3 miles from the Belgian town of Mouscron, and 6¾ miles N.E. of Lille by rail. It has factories for wool, cotton, flax, and silk spinning,

besides wool-combing and weaving, dyeing and sugar-refining. Upholstery wares, machinery, soap, and cutlery are also manufactured. Pop. (1876) 48,634.

Tour'maline, a mineral species, named from Tourmali in Ceylon, whence one of its precious varieties was first brought to Europe. It crystallises in rhombohedra, and it is also obtained compact and in columnar form. In composition and appearance T. is a variable and complex mineral, consisting principally of a compound silicate and borate of alumina and magnesia, but containing frequently iron, lithia, and other substances. Opaque kinds are generally distinguished as schorl, and the transparent varieties include various well-known jewellery stones, as the Brazilian sapphire, a deep-blue transparent stone; the Brazilian emerald or peridot, green and transparent; and the Ceylon peridot, of a honey-yellow colour. T. possesses powerful electric properties.

Tour'nament or **Tour'ney** (Fr. *tournoi*, from *tournoyer*, 'to wheel'), a trial of arms in which two mounted knights or bands of knights contended, ordinarily with blunted weapons, for the meed of valour. Traditionally invented by Geoffroy de Prenilly in the 10th c., these mimic combats of shivered lances and broken bones, spread in the teeth of clerical censure to most of the courts of Western Europe, reaching their zenith in the 14th c. Thenceforth they declined with waning chivalry, and after the accidental death of Henri II. of France (1559) were generally abandoned. Scott, glowingly describing them in *Ivanhoe*, suggested their revival (1839), but the elements fought against the Earl of Eglinton, umbrella and mackintosh assorting ill with casque and helmet.

Tour'nay (Flem. *Doornick*), a town of Belgium, in the province of Hainault, lies on both sides of the Scheldt, 15 miles E. of Lille by rail. Till lately fortified, it is modern in aspect, but has a Romanesque cathedral dating from the 12th c., and restored since 1852, with five great towers, rich painted glass, and pictures by Rubens and Jordaens. Other buildings are the churches of St. Jacques, St. Quentin, and St. Brice (containing Childerich's grave), the Belfry (1190; restored 1852), an hôtel-de-ville, athenæum, public library, museum, and five hospitals. T. has important manufactures of linen, woollen, and cotton stuffs, of carpets, porcelain, &c., and carries on a considerable river trade. Pop. (1878) 32,180. The *Tornacum* or *Turnis Nerviorum* of the Romans, T. was the seat of the Merwig monarchy, from Flanders passed to Philippe le Bel, and was ceded by France to Spain (1526). The Princess Marie of Espinay, whose statue (1863) adorns the Grand Place, defended it bravely against Parma (1581); and T. was again held by the French (1667-1709; and 1745-48).

Tourne'fort, Joseph Pitton de, a celebrated French botanist, was born at Aix, in Provençe, June 5, 1656. On the death of his father (1677), who intended him for the Church, T. turned all his energies to the study of natural history, and made a large collection of the flora of the country around Aix—a collection which ultimately came into the possession of the Paris Museum of Natural History. In 1683 he was appointed professor of botany at the Jardin Royal des Plantes. He subsequently made numerous journeys to Spain, Portugal, England, Holland, &c.; and in 1702 returned from an extended tour in Greece, Asia Minor, Armenia, and the Archipelago. His remaining years were occupied as director of the Jardin des Plantes, and professor of medicine at the Collège de France. He died at Paris, December 28, 1708. T.'s chief works are *Eléments de Botanique* (3 vols. 1694), written also in Latin; *Histoire des Plantes qui naissent aux Environs de Paris* (1698); *Relation d'un Voyage du Levant* (2 vols. 1717), and a *Traité de la Matière Médicale*, published posthumously by Besnier (2 vols. 1717), besides papers in the *Mémoires* of the Academy of Sciences.

Tour'neur, Tour'nour, or **Tur'ner, Cyril**, an English dramatist, who flourished in the latter end of Elizabeth's reign and the beginning of James I. The investigations of his most recent editor, J. C. Collins, have added almost nothing to the almost nothing that was previously known about his life. From a letter of Robert Daborne to Philip Henslowe, June 5, 1613, it appears that he was about that time employed as a playwright; but that is perhaps the only fact of his life that has been preserved. His works are as follows:—*The Transformed Metamorphosis* (1600); *The Revenger's Tragedy, or The Loyal Brother* (1607); *Funeral Poem on the Death of Sir Henry Vere* (1609); *The Atheist's Tragedy, or The Honest Man's Revenge* (1611), and a *Griefe on the Death of Prince Henrie* (1613). Another little book, *Laugh and Lie Down, or the World's Folly* (1605), being a prose allegory describing the Fool of Folly, with ballads interspersed, has been erroneously ascribed to him; and a MS. containing the tragic comedy of *The Nobleman*, undoubtedly from his pen, is known to have been burned by Warburton's servant in 1815. It is to his *Revenger's Tragedy* that T. owes the admiration of such men as Lamb, Hazlitt, and Swinburne; the first emphasises his realism, the second speaks of his 'dazzling fence of impassioned argument,' and the third is charmed by the 'bitter ardour and angry beauty of his verse.' In none of the other poems does he approach the same excellence, but in most there is a touch or two of his finer spirit. The *Transformed Metamorphosis* was written at leisure moments in three weeks, but its purely verbal obscurities would require the labour of a school of commentators for their complete elucidation. The only known copy of the original was discovered in 1872 by Mr. Charles Edmonds at Lamport Hall, in Hampshire. See *The Plays and Poems of C. T.*, edited by John Churton Collins (2 vols. Lond. 1878).

Tour'niquet, The, is an instrument used by surgeons for restraining hæmorrhage in amputations and other operations on the limbs. The common T. consists of a pad which is pressed down by a screw, attached by a large strap which encircles the limb, and thus as the screw is pressed down it tightens the strap, and makes pressure equally on the limb all round. In applying the T. care should be taken to direct the pressure so as to compress the artery against the subjacent bone. The Italian, Signorini's, or the horse-shoe T., is an arch of metal, larger than the limb, having an expanded piece to rest against the side opposite to the artery, while a screw carrying a pad is directed against the artery from the opposite side of the arch. The Italian T. has the advantage over the common T. in that it makes no circular compression of the limb, and produces a less amount of venous congestion. All the aneurism compressors, as well as the aortic T. for amputation at the hip, are made on this principle. The T. is now to a considerable extent superseded by the application of an elastic bandage, as recommended by Professor Esmarck, by which the limb is rendered bloodless. To prevent the return of blood a stout piece of elastic tubing is passed twice round the limb just below the upper end of the bandage, and secured by hooks. The bandage is then uncovered from the limb, which is perfectly bloodless. When the operation is concluded, and after the constricting band is removed, a few minutes should be allowed for the bleeding to subside under the use of cold water, after the main vessels have been tied.

Tours, a fine old town of France, capital of the department of Indre-et-Loire and of the former province of Touraine, on the left bank of the Loire, 145½ miles S.W. of Paris by rail. The river is crossed by two suspension bridges and by a stone bridge of 15 arches, one of the finest in Europe (1424 feet long, 48 feet broad), from which the principal street runs diagonally across the town, dividing it into two almost equal parts. The well-planted and extensive boulevards which surround the town, and the beauty of the banks of the river, with the regularity of the streets and the striking character of many of the buildings, combine to render T. one of the most agreeable towns of France. The finest buildings are the Gothic cathedral, St. Gatien (1170-1547), with a noble tower and fine stained windows; St. Julien's Church, the Palais du Justice, and the Hôtel de Ville. Interesting ruins are those of the abbeys of St. Martin-de-Tours, and Marmoûtier, and the Tour de Guise, the only remnant of the castle of the counts of T. T. has a library of 40,000 vols., a museum and picture-gallery, a botanical garden, a lyceum, a school of medicine and pharmacy, and several learned and benevolent associations. Active manufactures of woollen, cotton, and silk stuffs, tapestry, pottery, and porcelain, chemicals, leather, wax, and hardware are carried on. The silk fabrics of T. (*Gros de T.*) were once widely celebrated, but the revocation of the Edict de Nantes in 1685 drove the Huguenot workmen to Holland and England and ruined the prosperity of the town, reducing its population from 80,000 to 30,000. Pop. (1876) 48,325. T., called by the Romans *Cæsarodunum*, was the capital of the Gallic Turones, from whom it subsequently took the name of *Turoni*. Near it, in 732, Karl Martell and his

Franks won the decisive battle which saved Christendom and turned the tide of Arab conquest. The town was in 1503 under Henri III. the seat of the parliament, and in the late Franco-German War, after the investiture of Paris, it was the seat of the Government of National Defence. It was taken by the invaders January 19, 1871. See Giraudet, *Histoire de T.* (Par. 1873).

Tour'ville, Anne Hilarion de Cotentin, Comte de, a famous French admiral, born at Tourville, La Manche, November 24, 1642. He joined the Maltese Order in 1656, and in 1660 entered the French navy, of which he became a captain in 1667, and commanded a ship of the line in the Mediterranean during the war with the Dutch and Spaniards (1672-74). In 1675 T. served first under the Chevalier de Balbette, then under Duquesne; and on the return from Agosta, where he fought with distinction, he destroyed 12 ships of the Dutch-Spanish fleet at Palermo (1677). He was appointed lieutenant-general of the navy (1680), and bombarded Algiers three times (1682, 1683, and 1688). Vice-admiral of the Levant in 1689, he commanded in 1690 the fleet that supported James II. in Ireland; and in command of the French channel fleet defeated the Dutch and English fleets (112 sail) at the Isle of Wight in July 1690. In order to facilitate the landing of the Jacobites on the English coast, he was ordered to attack with 44 ships the British and Dutch fleets under Admiral Russell at Cape de la Hogue, and was defeated. In 1693 he was made Marshal of France, and in 1694, meeting an English and Dutch trading fleet, he took 27 vessels and destroyed 4 in the pursuit. He died at Paris, May 28, 1701. See Richer, *Vie de T.* (Par. 1783); and Maureix, *Théorie du Maréchal de T.* (Par. 1878).

Touss'aint, Anna Luize Geertruide, a popular Dutch novelist, was born September 16, 1812, at Alkmaar, and married in 1851 to the painter Bosboom. In 1837 she published her first novel, *Almagro*, which was followed by *De Graaf van Devonshire* (1838) and *De Engelsche in Rom* (1840). Her greatest historical works are the historical novels *Het Huis Lauernesse* (2 vols. 1841), placed in the Reformation period, which has been translated into several languages; *Leycester en Nederland*, *De vrouwem van het Leycester' sche Tijdperk*, and *Gideon Florenz* (the last three forming 9 vols. 1851-54).

Touss'aint, François Dominique, surnamed **L'Ouverture,** was born at Breda, Hayti, in 1743, of slave parents of pure negro blood, and availed himself of the insurrection of the slaves in 1791 to become ruler of the entire island, January 1801 (see HAYTI). He was subsequently treacherously arrested with the connivance if not by the orders of the French general Leclerc and conveyed to France, where he died at the castle of Joux (dep. Doubs) of ill-treatment, April 27, 1803. In character T. seems to have been merciful, and by no means destitute of noble emotions; of his military and administrative talents there can be no doubt. He is the hero of Miss Martineau's novel, *The Hour and the Man* (1839). Various Memoirs of T. have appeared, the latest of which is by Gragnon-Lacoste (Par. 1877).

Tower of London, The, the most ancient, and historically the most interesting pile in the English metropolis, is a mass of buildings on the N. side of the Thames, immediately to the E. of the ancient city walls, its ramparts and gates surrounded by a dry ditch in pentagonal shape, in outer circuit measuring 1050 yards. Within this the whole of the buildings are encircled by a double line of walls and bulwarks, in some places 40 feet high and 12 feet thick; the space between the walls being known as the outer ward, and the interior as the inner ward. The inner ward was formerly the royal quarter. The outer ward was the folk's quarter. The inner ward is defended by 12 massive and conspicuous towers, stationed at unequal distances, and possessing distinctive names and formations. In the centre, rearing its head proudly above them all, stands the main quadrangular building and great Norman keep known as the White Tower. To the N. are the barracks, and to the N.W. the church of St. Peter ad Vincula. The entrance to the buildings is on the western side by the Lion's Gate.

Tradition ascribes the origin of the Tower to Julius Cæsar. The White Tower was reared by William the Conqueror, probably as a secure place of shelter for himself and a menace to the turbulent citizens. It was designed by Gundulph, Bishop of Rochester, and bears a sister likeness to Rochester Castle. It is in three stories, is 116 feet long, 96 feet wide, and 92 feet high. Gundulph also designed the original church of St. Peter's, a finer building than that reared in its place when it crumbled into ruin in the reign of Edward I. Henry III., who left so many epics in stone to attest his architectural genius, spent much of his life and treasure in adding to the splendour of the Tower. He enriched it with frescoes and sculptures, with marble shafts and delicate traceries. Traitor's Gate was built by him, the noble arch under which so many noble heads passed to their doom. Wren refaced the White Tower and modernised its windows, but its interior still bears the splendid stamp of its grand antiquity.

For centuries the Tower was a palace, a prison, a fortress, and a court of law. Here the Plantagenet kings held their gay tournaments, magnificent revels, and pompous religious ceremonials. Here also tragedy succeeded tragedy, and the innocent blood of many of England's bravest and beautifulest poured forth in a cruel stream. Wise statesmen, fair queens, child-princes, noble warriors and priests were slain, their only crimes in many cases being their rank, their patriotism, and their faith. 'No sadder spot on earth,' says Macaulay, 'in England . . . . . Death is there associated . . . . . with whatever is darkest in human nature and in human destiny, with the savage triumph of implacable enemies, with the inconstancy, the ingratitude, the cowardice of friends, with all the miseries of fallen greatness and of blighted fame.'

The first state prisoner was Flambard, Bishop of Durham, who effected his escape in 1100 and fled to Normandy. The noble Wallace suffered a cruel imprisonment and terrible death here in 1305. The good Lord Cobham's story and fate are associated with the Beauchamp Tower. Charles, Duke of Orleans, imprisoned in the Banqueting Hall for a quarter of a century by Henry V., commemorated there his dead wife in touching verse. A volume of his poems in the British Museum contains the earliest known representation of the Tower. Richard, Duke of Gloucester, haunts the pile like a spectre. He murdered Henry VI. in the Hall Tower. The infant princes, his nephews, were smothered in the Bloody Tower; their supposed remains, found in the reign of Charles II., now lie in Westminster Abbey. Clarence, according to tradition, was drowned by Richard in wine in the Bowyer Tower, and Hastings condemned to death in the Council Chamber. The remains of King Henry VIII.'s beheaded queens, Anne Boleyn and Katherine Howard, lie in St. Peter's Church. A group of ghastly executions are associated with the reign of Mary, prominent among which are those of Lady Jane Grey, the wise, fair, and pious 'Twelfth Day queen,' her consort Dudley, and her father-in-law Northumberland. Imprisoned together in the Garden Tower, Cranmer, Ridley, and Latimer searched the New Testament together. Sir Walter Raleigh was thrice confined in the Tower which bears his name in many places. Here he wrote his *History of the World*, and beguiled his solitude with chemical experiments. Sir T. Overbury was poisoned in the Tower in 1613, and Strafford was beheaded in 1641, Laud in 1645. The last of the numerous executions in the Tower, but a few of which have been mentioned, was that of Lord Lovat in 1747. Among notable persons imprisoned here were Algernon Sydney, Lord William Russell, the Seven Bishops, the Duke of Marlborough, Sir Robert Walpole, John Wilkes, Lord George Gordon, and Sir F. Burdett. Arthur Thistlewood, in 1820, was the last state prisoner.

The public are admitted to the Tower on Mondays and Saturdays gratis, and on other days on payment of 6d. to see the Armoury and White Tower, and 6d. to see the crown jewels. The government of the Tower is vested in the Constable, usually an officer of high military rank. Strangers are shown over the buildings by the warders or beefeaters. The Records and the Mint, now removed, were for a long time established in the Tower, which is now a great ordnance store and depository of valuables. In the White Tower is the 'Chapel of St. John,' which formerly held the records, one of the finest specimens of Early Norman style. The Banqueting Hall and Council Chamber adjoining is used as an armoury, and is filled with 60,000 stand of arms, kept in perfect order and beautifully arranged. On the south side of the White Tower there are some interesting specimens of early gunnery. The Beauchamp Tower, which was restored in 1853 by Mr. Salvin, is to the west, and the Horse Armoury to the south. The latter, built in 1826, contains a gallery 150 feet long by 33 feet wide, in which are twenty-two

equestrian figures clothed in the distinctive armour of the reigns from Edward I. to James II. A staircase from the Horse Armoury leads to an antechamber filled with weapons and trophies taken in our struggles in the East. Queen Elizabeth's Armoury in the White Tower contains arms and armour of her reign, various instruments of torture, the beheading axe said to have been used in the execution of the Earl of Essex, and the block on which Lord Lovat was beheaded. The Jewel House contains several crowns, including that made for the coronation of Queen Victoria (valued at £111,900), the Kohinoor Diamond, and the diadems, sceptres, and jewels constituting the Regalia. The Wellington Barracks, a large castellated building on the north side of the West Tower, were erected in 1845, on the site of the Grand Storehouse built by William III., which was, along with 280,000 stand of muskets contained in it, destroyed by fire in 1841. To the north-west of the Tower is Tower Hill, the dire spot where, till within 150 years ago, stood the scaffold for the execution of traitors.

See *Historical Memorials of the T. of L.*, by Lord de Ros (1866-67), *Her Majesty's Tower*, by W. Hepworth Dixon (6th ed. 1871), and *Notice of Historic Persons buried in the Chapel of St. Peter ad Vincula*, by D. C. Bell (Lond. 1877).

Town-Clerk' is the clerk to a municipal corporation. He keeps the records of the borough, and takes charge of the voting papers at municipal elections. He is paid from the borough funds, and is elected by the Town-Council (q. v.). In England the town-clerk's tenure of office depends on the will of the council; in Scotland it is *ad vitam aut culpam*. In the latter country he is bound to give extracts from the records without reference to the town-council, and he is personally liable for any failure of duty.

Town-Coun'cil. See BURGESS; CORPORATIONS; MUNICIPALITY.

Town-Ma'jor, Town-Ad'jutant, officers holding the rank of captain and lieutenant respectively, who regulate garrison details and duties, such as the supervision of guards, military police, paroles, the roster of officers for garrison duty, the issue of garrison orders, &c.

Town'shend, Charles, an English statesman, born at Rainham, Norfolk, 10th March 1674, in 1687 succeeded his father as second Viscount T., and took his seat as a Whig in the Upper House (1695). Having acted as a commissioner for arranging the Scottish Union (1706), he was joint-plenipotentiary with Marlborough in the unsuccessful negotiations at Gertruydenburg (1709), and next as Ambassador to the States-General signed the Barrier Treaty. For this he was censured by the House of Commons, and declared an enemy to Queen and kingdom—a disgrace which led him warmly to espouse the Hanoverian succession. Accordingly, under George I. he was head of the administration from 1714 to 1716 as Secretary of State, which office he resumed in 1721. This time, however, he shared his power with his brother-in-law, Walpole (q. v.), a quarrel with whom was followed by P.'s resignation and withdrawal to Rainham, where he died 21st June 1738. Generous but overbearing, rough and impetuous but of spotless honour, T. deserves to be remembered, if only for the introduction of the turnip to his native county. See the Histories of Stanhope (1853) and Lecky (1878).

Town'shend, Charles, grandson of the above, was born 29th August 1725, and entering Parliament in 1747 as an adherent of the Pelham government, was created a commissioner of trade and plantations (1759). Having made a name by his speech against the Marriage Bill (1753), he became a lord of the Admiralty (1754), a member of the Privy Council (1756), secretary of war (1761-63), first lord of trade and plantations (1763), and paymaster of the forces (1765). He 'had belonged,' says Macaulay, 'to every party and cared for none,' and now in 1766 he accepted the chancellorship of the exchequer in Chatham's Ministry, together with the leadership of the House of Commons. Stirred by a taunt from Grenville, T. introduced and carried the Colonial Importation Bill, the cause of the War of American Independence, but he did not live to see its issue, dying suddenly within three months, 4th September 1767. More popular than Pitt, by Macaulay styled 'the most brilliant and versatile of mankind,' by Burke 'the delight and ornament of the House of Commons,' the 'Weathercock' is now remembered but by his witty sayings, many of which are recorded in the Life of him by Percy Fitzgerald (1866). See also vol. iv. of Bancroft's *History of America* (new ed. 1876).

Town'ship, in English law, is a division of a parish with a constable of its own.

Toxicol'ogy (Gr. 'the science of poisons') is the term commonly employed in medical jurisprudence to designate the science of Poisons (q. v.). T. embraces a consideration of all known poisonous substances, their physical and physiological properties, the post-mortem results which they occasion, and the modes by which they may be detected by chemical re-agents, and microscopic and other modes of examination.

Toxoc'eras (Gr. 'bow-horn'), a genus of extinct *Cephalopoda* (q. v.) or cuttlefishes belonging to the family *Ammonitidæ*, and having a bow-shaped or armate shell. Species of T. occur in rocks ranging from the Lower Oolites to the Gault. The most typical development is found in the Cretaceous rocks.

Tox'odon (Gr. 'bow-toothed'), an extinct genus of Mammals forming the type of the order *Toxodontia*, the remains of which are found in recent deposits in S. America. The Toxodonts, of which only two genera (*Toxodon* and *Mesodon*) are known, present a singular combination of the characters of Ungulata (q. v.), Rodentia (q. v.), and Edentata (q. v.). The skull is large, and the molar and premolar teeth are strongly bent or folded. These teeth were rootless, and grew from permanent pulps. The lower jaw had small canine teeth, occurring, like the canines of the horse, between the incisors and premolars. No traces of limbs have been found in a fossil state.

Toys are chiefly manufactured in Germany and France, whence they are exported to all civilised quarters of the globe; and in Switzerland, England, and the United States, toy-making is also an important and expanding industry. The materials used are very numerous and varied, and the processes by which the T. are manufactured are frequently clever and interesting. Nürnberg, formerly the toy-emporium of Germany, manufactures large quantities of wood and metal T.; Sonneburg and neighbouring villages produce an abundance of playthings in wood and papier-maché; Marburg in Hessen has a specialty in musical T.; and Biberach in Würtemberg is famed for its substantial and nicely painted metal articles, including carriages, locomotives, furniture, &c. Wooden T. are to a large extent fashioned on the lathe. In Saxony an ingenious process is pursued in the production of figures of animals. A circular block of soft wood is turned into a ring of such a pattern that by slicing it vertically a rough representation of an animal (say an elephant) is secured. The size of the ring depends upon the required size of the animal. Each rudimentary figure is then trimmed by hand, the ears, trunk, tusks, and tail (all separately turned by a similar process) are inserted, and the elephant is finished by being painted and varnished. T. in papier-maché and other compositions are formed in carefully made moulds of plaster-of-Paris and sulphur, and are subsequently painted. Durability and cheapness are the distinguishing qualities of German T. The playthings of French production, on the other hand, are celebrated for their artistic merit and attractiveness; and the French doll, owing to its beautifully modelled head of porcelain, articulated body, and rich and tasteful *trousseau*, occupies the first rank. Ingenious and highly finished clockwork, musical and mechanical T., are also specialties of France. The Swiss excel in carved wood animals, châlets, &c. England's chief production in toy art is the wax doll, in which that country has no rival. The doll has a nicely modelled head of wax, with eyes of glass and luxuriant tresses. Inferior varieties of English dolls are known to the trade as 'composition' and 'rag' dolls. London also excels in the production of T. in glass, porcelain, stoneware, pewter, and other metals, as well as in ivory and common and choice woods; and there has lately been a remarkable development in the manufacture of T. in vulcanised indiarubber, vulcanite, &c. A small export trade in T. is carried on with India and the colonies; in 1877 it reached the amount of £33,235. We imported in the same year T. valued at £444,829 (£234,635 from Germany). The United States, which formerly drew all its supplies from Europe, now not only makes the most of its own T., but exports a great number of common kinds as well as of sensational T. of native invention. The export trade of 1877 amounted to over $1,000,000.

Tra'cery, in Gothic windows, the lace-like divergency of the mullions into circles, quatrefoils, and other geometrical figures (Early Decorated style), into flowing, elaborate forms (Late Decorated), and into a blending of curved and horizontal lines (Perpendicular).

Trach'ea (Gr. *trachys*, 'rough,' so called from the rough gristle of which it is composed), or **Windpipe**, the name given to the tube extending from the *Larynx* (q. v.) or organ of voice, and from the level of the fifth cervical vertebra to the third dorsal vertebra, at which latter point the T. bifurcates or divides into two main *bronchi* or divisions, one supplying each lung with air-tubes. The average length of the T. is 4½ inches, and its diameter about ⅘ths of an inch, the latter measurement being greater in males than in females. The T. consists of fibrous membranes united by elastic cartilaginous rings, rendering the tube flexible and patent. The cartilages are circular but imperfect rings, each being joined posteriorly by fibrous membrane. They vary from 16 to 20 in number. The *muscular fibres* of the T. are of *longitudinal* and *transverse* arrangement. The T. is lined with *mucous membrane*, the epithelium of which is ciliated. The T. receives blood from the *inferior thyroid arteries*, and nerves from the *pneumogastric* and *recurrent* trunks, and also from the *sympathetic system*. The *right bronchus*, or one of the main divisions of the T., is wider and shorter than the left. It enters the lung opposite the fourth dorsal vertebra. The left bronchus is smaller and more oblique than the right, and enters the left lung at the level of the fifth dorsal vertebra. Foreign bodies falling into the T. most frequently enter the right bronchus, because of the larger size of the latter, and because of the more oblique position of the left bronchus.

Diseases and Injuries of the T. The T. is liable to inflammation and its products, and frequently suffers from extension of disease from the larynx. *Acute inflammation* of the T. may occur as an idiopathic affection, or a symptom of other diseases, as smallpox, measles, typhus, tuberculosis, croup, &c. The symptoms are pain in the windpipe from the top of the sternum, expectoration of mucus, sometimes in regular rings, and a peculiar brazen-like cough. When confined to the larynx there is no hoarseness. *Chronic inflammation* of the T. usually accompanies follicular pharyngo-laryngitis, tuberculosis, and syphilis, and may extend to the submucous tissues and the cartilaginous structures, resulting in ulceration, cicatrisation, and stricture. The treatment consists in rest, the application of warm poultices, the inhalation of steam impregnated with balsamic or anodyne substances, and the administration of antiphlogistic remedies. Sulphate of zinc or nitrate of silver may be applied locally with the sponge probang, or the douche. *Constriction* of the trachea may be produced by aneurismal or other tumours pressing externally on the T.; or the symptoms may be produced by pressure on the nervous trunk, or the inferior laryngeal fibres. Constriction may also depend on undue muscular contraction, the seat thereof being immediately above the bifurcation of the T. *Foreign bodies* occasionally pass through the larynx into the T., and the accident is a formidable one, which not unfrequently proves fatal. The accident occurs most frequently among children, and is caused by a sudden inhalation while holding something in the mouth. Occasionally, however, a foreign body may, during the act of swallowing and without an inhalation, pass under the epiglottis and into the upper part of the larynx. Foreign bodies in the windpipe may be arrested above the rima glottidis, between the vocal cords, in the cavity of the larynx, or in the T. In such cases the patient is suddenly seized with convulsive cough and dyspnœa. The speech is more or less affected, and the breathing is whistling or stridulous; but the diagnosis rests mainly on the sudden accession of the symptoms. When the presence of a foreign body is made out, it ought to be removed at once. When the body is loose in the T., a free opening lower down should be at once made, and the opening may be either longitudinal or transversely valvular. It is advisable in nearly all cases to open the T., as, by securing a free aperture for respiration, spasm of the glottis is obviated, and the foreign body may be removed through the artificial opening, or it may fall through the glottis into the mouth. *Fracture* of the T. occurs from direct violence, and in such cases the wounded part should be laid freely open, so as to secure the passage of air to the lungs. Union of the wound by suture is to be avoided, that by suppurative inflammation being preferable, the head and neck being retained in a suitable position. Foreign bodies in the T., and all kinds of injury from external violence, are serious affections, as disease of the lungs is apt to be induced.

Tracheot'omy. The windpipe may be opened in three different positions, viz., between the cricoid and thyroid cartilages, above the thyroid isthmus, and below it, and all three operations are often termed T. The operation, through the crico-thyroid interval, is properly termed *laryngotomy*, that above the thyroid isthmus *laryngo-T.*, and that below the thyroid isthmus, T. The operation is performed as follows:—An incision is made in the middle line, from an inch and a half to two inches, downwards from the cricoid cartilage through the skin and deep fascia. Any arteries wounded in this incision being secured, the subcutaneous connective tissue is divided, fold after fold, the large vessels being pressed aside or ligatured when required. The sterno-hyoid and sterno-thyroid muscles are then separated by the handle of the knife, exposing the upper portion of the trachea, which is usually covered by the isthmus of the thyroid gland, which may be drawn up with a hook if it is unusually broad. The trachea should be carefully dissected until three rings are exposed. A sharp tenaculum is then thrust into it, and it is raised somewhat upwards and steadied, and then divided from below upwards by a sharp-pointed bistoury inserted into one of the interspaces. The completion of the operation is confirmed by the peculiar hissing sound with which the air rushes out of the open wound. The next step is the introduction of the canula, which soon becomes obstructed with mucus, and the inner tube must often be withdrawn for the purpose of cleansing it. The canula must be secured by a piece of tape round the neck, and the edges of the wound above and below the canula may be brought together by stitches or by adhesive plaster. The room in which the patient is confined should be kept warm at a temperature of not less than 80° F., and more or less of an atmosphere loaded with steam should be secured by some means. T. may be necessary in cases of disease or injury which produce mechanical impediment to the passage of air from the mouth into the trachea, in cases of foreign substances in the air passages, and in some cases of suspended animation where artificial inflation of the lungs cannot be performed by the ordinary means.

Trach'yte (Gr. *trachys*, 'rough'), a generic term applied to certain felspathic rocks, on account of the harsh, gritty feeling which many of them present to the touch. The felspar seems invariably one of those varieties which are richest in silica, and along with it are frequently disseminated such minerals as mica, quartz, and hornblende. *Obsidian* and *Pitchstone* have been demonstrated experimentally to consist of fused and vitrified trachytic rocks. *Pearlstone* is of similar origin, but is built up of numerous small grains or nodules aggregated together. *Clinkstone*, another trachytic rock, splits readily into laminæ, sometimes fine enough for roofing-slates, and owes its name to the clear ringing sound it emits when struck with the hammer.

Tra'cing-Paper is thin paper rendered translucent by brushing over it a mixture of turpentine and an oleo-resin, such as Canada balsam. A thin coating of the varnish is first applied, so as to permeate the paper, which is afterwards coated on both sides more thickly till an equal translucency is obtained. The paper should be kept warm during the operations, and thoroughly dried before use.

Tracta'rianism, the Romeward movement in the English Church, which dates, says its founder, John Henry Newman, from July 14, 1833, the Sunday when Keble preached upon the 'National Apostasy.' Its causes were twofold—the spirit, on one hand, of Romanticism turning men's minds to mediæval times; and, on the other, reaction from the great Liberal wave that swept away Catholic disabilities, threatened the wealth of the Established Church, and bore German rationalism over to England's shores. Something was wanted to stem this wave better than the quiescent Anglicanism in which bishops could doubt whether Apostolical Succession formed part of their creed or no; one needed positive dogma and belief in a Church founded like Rome upon antiquity, while free from Romish, *i.e.*, non-primitive, error. Antiquity! but where then draw the line—at apostolic, patristic, or pre-Tridentine times? Purity! did it consist in the rejection of transubstantiation, of mariolatry, or merely of papal infallibility? Such were the problems mooted by a small band of Oxford scholars—Newman (q. v.), the subtle Aristotelian, Pusey

(q. v.), whom Newman styled 'the Great,' Keble (q. v.), the gentle singer of the *Christian Year*, Faber (q. v.), as winning as easily won, Manning (q. v.), the after 'hierarch,' and Hurrell Froude, whose untimely death in 1836 arrested the foremost in the race to Rome. And such were the problems offered a wondering world in the ninety anonymous *Tracts for the Times* (1833-41), whence 'Anglo-Catholics' were dubbed Tractarians, and in which was discerned a steady approximation to the faith of Rome, due partly to their avowed economy or reserve (*disciplina arcani*), but more to the necessary albeit unconscious development of their starting principles—Apostolical Succession, a Real Presence, Baptismal Regeneration, Tradition, and the like. Those principles were not new; they could be backed by reference to writers of the school of Laud (q. v.), nay to the Prayer-Book's self, whose 'Calvinist Articles' even were capable, by Tract 90's showing, of Catholic interpretation. How 'comprehensive' is the English Church, has since been shown in the Gorham and Bennett judgments; but then, in 1841, the question was: Would Churchmen admit Tractarian teaching, whether such teaching were or were not the Church's own? The storm of indignation that greeted Tract 90 gave plainly the answer No! and by that answer T.'s doom was sealed. Two courses remained for Tractarians—one to go forth from a Church that pronounced their opinions heresy, the other to keep both offices and opinions in flat defiance of those 'Successors of the Apostles' whom they at ordination vowed to obey. The first course Newman chose, crossing the Rubicon—an insignificant stream—to Rome; the second Pusey, and with him many of the heavier troops—those burdened, namely, with wives and families. Yet these Epigoni have loitered by the brink, and, if not quite at Rome, copy from their near vantage-ground the doings of Rome with constantly-increasing skill. Their creed (*plus* Infallibility and *minus* the Right of Private Judgment) has been given already under ROMAN CATHOLIC CHURCH, so need not be given anew; its outward expression may be looked for indifferently in the *Priest's Prayer-Book* and *Directorium Anglicanum*, or in the *Missal* and *Garden of the Soul*. The truth or falsity of that creed *per se* far exceeds the narrow bounds of the Tractarian controversy, which should limit itself to the single point of the creed's application by Tractarians to the English Church—a proceeding Catholics might compare with the ascription of a king's healing touch to bastard Monmouth, Low Churchmen with the investiture of Philippe Egalité with the divine (but abdicated) right of kings. Few even of the hottest Protestants would deny to Cardinals Manning and Newman their present right to believe in transubstantiation; but Messrs. Denison, Tooth, Mackonochie, and Carter, the State-paid officers of an Established Church, in upholding doctrines repudiated by that Church at large, and by the State protested against in the Public Worship Regulation Act of 1874, seem to an ordinary looker-on to be breaking a contract, to be not unlike 'those perfidious statesmen of the 17th c. who, loaded by William with benefits, kept up a correspondence with exiled James.' They at least are satisfied with their position, as in a measure is the Roman Church; Pusey by Pio Nono being likened to 'the church-bell, which rings people into church, though it does not come in itself.' And even their fellow-Protestants may thank them for hastening on disestablishment, or for raising doubts that have shipwrecked Clough's and many another noble mind, or for the £25,548,703 expended, thanks to T., on 8871 cathedrals and churches in England and Wales during 1840-76. See Froude's *Remains* (4 vols. 1838-39); H. Rogers' *Essays* (1850); Newman's *Apologia* (1864); Pusey's *Eirenicon* (1865); Thirlwall's *Remains* (3 vols. 1875-76); and Coleridge's *Memoir of Keble* (new ed. 1874).

Trade, Board of. See BOARD OF TRADE.

Trade-Marks. The Trade-Marks Registration Act (1875) for the United Kingdom defines a trade-mark as a 'name of an individual or firm printed, impressed, or woven in some particular and distinctive manner, or a written signature of an individual or firm; or a distinctive device, mark, &c.; and there may be added to any one or more of the said particulars, any letters, words, or figures, or combination of letters, words, or figures,' the use of certain specified devices and words being excepted. The 'signs' belonging to tradesmen in the Middle Ages were heirlooms, but were gradually disused, until, from the development of international commerce, a 'sign' on goods for sale became a necessity. The piracy of such marks became itself a trade among unscrupulous and inferior tradesmen; and for this abuse there was no real redress in Great Britain till the passing of the Act of 1875. The purchaser had to submit to the imposture, and the real owner of the trade-mark alone could pursue the fraudulent dealer. The difficulty of proving priority in the use of T.-M. made it impossible that justice could protect the right of 'property' until this Act provided for the registration of T.-M., and the existence of a legal register open for examination. Registration is effected by formal application to the Registry Office, London. The total fees amount to about two guineas. Registration is not compulsory; but one whose trade-mark is not registered cannot criminally pursue another who has appropriated it, although the matter of priority in its use may be subject to judicial examination.

Frauds in T.-M. The laws relating to the fraudulent marking of merchandise were amended by statute in 1862. T.-M. are defined as including every name, letter, or device used by any one to distinguish his manufactures from those of others. Forging a trade-mark with intent to defraud, or to enable another to defraud, is a misdemeanour, the fraudulently-marked merchandise, with the instrument used in the forgery, being forfeited. 28 and 29 Vict. c. 119 enacts that if any trader falsely represents that he has obtained a medal or certificate from the Exhibition of 1851 Commissioners, on account of any article or group, he shall be liable for the first offence to a penalty of £5, and for a second to a penalty of £20. Penalties are summarily recoverable before two justices in England and Ireland, and in Scotland may be prosecuted before the sheriff or before two county justices. The Act affects no civil right of remedy. A false indication of quantity is punishable by law.

Trade-Protec'tion Soci'eties are associations formed by traders for mutual protection against losses in business transactions. They are supported by annual subscriptions of small amount, which are in effect insurances against fraud. At the offices of the societies, registers, for the use of members only, are kept, of frauds, bankrupts, known swindlers, changes of residences of debtors, &c.; while private circulars are disseminated containing confidential lists of bills of sale, judges' orders, warrants of attorney, cognovits, county-court judgments, lists of bankrupts, assignments, trust-deeds, and of any fraudulent proceedings by which trade generally or individual interests may be affected. The societies also give gratuitous legal advice in certain matters, and undertake to act through their solicitors as agents in the recovery of debts, and in investigations in bankruptcies on certain terms. The operations of the societies, if distasteful to dishonest persons, afford protection to deserving debtors, who, instead of being subjected to the expense of legal proceedings, are enabled to pay their debts by instalments. Information is given as to the propriety of giving credit to any person who has ordered goods from members. One of the largest of the metropolitan T.-P. S. is the London Association for the Protection of Trade, in Berners Street, which has branches at Exeter, Plymouth, and Brighton. During the last six years it has recovered for its members £635,000, and made inquiries affecting property to ten times that amount. Among the leading provincial associations are the Liverpool Guardian Society, the Northern Counties Association, the Scottish Trade-Protection Society of Edinburgh, and the Glasgow and West of Scotland Guardian Society. The associated societies are enabled to give valuable information in upwards of two thousand cities, towns, and villages throughout the United Kingdom.

Trades-Unions, organised voluntary combinations of workmen in particular branches of industry with the object of securing the most favourable conditions of labour.

In this country the earliest form of voluntary associations of men for mutual help and support were the Frith Guilds, which were recognised as responsible bodies by Alfred and Athelstane. In towns the different guilds often became unified the better to carry out their objects, and the terms citizen and guild-brother were sometimes identical. With the increase of wealth and population a more general division of labour between wholesale tradesmen and craftsmen gradually arose, and the craftsmen were latterly practically excluded from the guilds, which assumed the shape of mercantile oligarchies; consequently craft guilds were formed, the earliest being that of the weavers in the 12th c. At that time craftsmen were usually small masters, and there was no actual working class in the present meaning of the word. After the plague of 1348 wages were regulated by a statute,

which caused a revolution in the relations between labour and capital, and ranked them on opposing sides. Craft guilds declined and journeymen fraternities sprang up, led by the building trade, which in the large number of men employed and the few masters under whom they served most nearly resembled modern manufacturing concerns. The Statute of Apprentices, 5 Elizabeth, c. 4, codified the order existing for centuries among craft guilds, and applied it to all trades. By this Act every master or journeyman was obliged to serve an apprenticeship of seven years—the hours of labour were to be twelve hours in summer, and from day-dawn until night in winter, and wages were to be assessed yearly by justices of the peace. The woollen manufacture was for a long time the staple trade of England, and was regulated by this Act. But before 1720 the assessment of wages by the justices of the peace fell into disuse, and the absence of a fixed rate of wages led the workmen to combine. In 1756, when the workmen petitioned the justices to fix the rate, the masters objected, and the justices refused the petition. The workmen consequently revolted, and a strike on their part led to riots and to the masters agreeing to their demands. The justices were then ordered by 29 Geo. III. c. 33 to settle the rate of wages yearly, but the whole system was on the eve of a great change. The introduction of machinery substituted large mills and factories for small businesses, and manufacturers freely employed women and children in addition to journeymen and apprentices. T.-U. were then formed by the workmen to resist the action of employers of labour, and to maintain the independence of artisans and the consolidation of their order. Among the earliest combinations were those in the woollen trade, the shipwrights of Liverpool, the hatters, the tailors, the printers in London, and the ironfounders in Staffordshire. In 1824 a committee of the House of Commons was appointed to consider the laws relating to workmen, which resulted in the Act of 1824 (5 Geo. IV. c. 95), making certain combinations of workmen for the first time allowable. This statute was repealed and reproduced with some alterations next year in Act 6 Geo. IV. c. 129. The Court of Queen's Bench decided in 1867 that T.-U. had no right to hold property. This resulted in a Royal Commission being appointed to investigate the subject. By Russell Gurney's Act, 31 and 32 Vict. c. 116 (1869), the funds of the unions were for the first time protected by law, and this protection was further extended in 1871 by Act 34 and 35 Vict. c. 31, and in 1876 by Act 39 and 40 Vict. c. 22.

T.-U. are to a great extent banks for the relief of men out of work, although most societies offer advantages also in case of sickness, accidents, &c. The age of entrance for fully-qualified and voting members is usually fixed at not younger than 21, and members are elected personally by the members of the lodge or branch to which they belong. An entrance-fee is charged, and thereafter uniform weekly subscriptions of from 1s. to 2s., the accumulation of which forms the reserve-fund, to cover expenses of strikes, &c. Unions are managed by superintending or executive councils, annually elected by the members by ballot, and including a president, treasurer, and secretary. The books and accounts are audited by the members, and the salaries paid to officers are not large, varying for presidents from 1s. per meeting-night to £40 a year, and for treasurers from 1s. for each attendance to £20 a year. The highest salary paid in 1878 to an officer was £234 to the secretary of the great society of Amalgamated Engineers. The government of every society and all its decisions belong exclusively to the council. When funds are insufficient, a levy is made on the members. The larger and not merely local organisations are divided into a number of branches or lodges, who have their special funds and elect their own committees. In some unions the central council is composed of delegates elected by the various branches; in others, the committee of each branch acts in turn in that capacity. If any branch strikes without the sanction of the central authority, it loses the support of the union. The balance in hand of each branch is in certain unions carried every year to a common fund, while in others the branches exercise complete independence in financial matters, subject to the liability of contributing if necessary to the funds of any branch needing assistance. When members cease to subscribe they are expelled. All efforts at a national federation of T.-U. have hitherto failed. Annual congresses of delegates from T.-U. have been held in leading towns of Great Britain from the first at Manchester in 1868 to that at Bristol in 1878, the proceedings having always been open to the press and public.

The legality of these organisations could not be established unless they were purely voluntary, and coercion on their part is clearly a violation of the law. In 1866 attention was called to violence and outrages stated to be committed by T.-U. Commissions of inquiry in several towns failed to find the unions guilty, but at those held at Sheffield and Manchester, outrages were proved which thrilled the country with horror. In the former place two murders and fifteen attempts at personal violence, and in the latter a wholesale destruction of non-unionists' property, were proved. Among the most reprehensible practices which have existed in unions are those of *rattening* and *picketing*. Rattening is the taking away of a workman's tools who is in arrear with his contributions to the union. Picketing is watching works during a strike by pickets, who endeavour to dissuade men who are willing to work from doing so. Where argument is alone used it is legal, but where it is combined with hissing, jeering, and taunting, or with personal violence, it deserves severe punishment. Owing to increased facilities for disseminating information, picketing is yielding as a regular system. The class of workmen who take advantage of a strike to obtain high wages, with the intention of seeking employment elsewhere upon its termination, are known among unionists as the 'blacks.' Unionists often refuse to work with them, or to speak to them. A few unions have wished to fix a limit to the amount of work that each man is to be allowed to perform, and by establishing a uniformity of wages to bring all down to one dead level of mediocrity. But the spirit of emulation has not been extinguished by unions, and many of their members have risen to be masters.

The recognition of T.-U. by the legislature has abolished secret societies. For good or evil they are a great English social force, and their number and strength steadily increases. Sixteen of the leading unions in January 1877 had 2723 branches, 208,318 members, and an income of £377,722. Their expenditure was £333,142, and their funds in hand £603,065. The most important society was the Amalgamated Engineers, with 390 branches and 44,578 members. Next came the Boiler-Makers and Iron Shipbuilders, the Masons, the Amalgamated Carpenters, and the General Union of Carpenters. The Agricultural Labourers since the year 1872 have established three large separate unions. Many unions have newspapers. The total number of independent societies amounts to nearly 3000, with 1,250,000 workmen, and their total income to at least £2,000,000. Startling as those figures are, they do not adequately express the power of the unions. In case of need, vast numbers of workmen, not regular members, swell their ranks, and for all practical purposes they represent the flower of the artisan population. Though non-political in character, they have taken part in certain great movements, and they played a prominent part in the Reform Struggle of 1866–67.

See the annual reports of the several T.-U. Congresses and Parliamentary Committees since 1868; 'Reports of the Royal Commission on the Organisation and Rules of T.-U.' (eleven in number), 1867–69; 'The Good and Evil of Trades-Unionism,' by Frederic Harrison (*Fortnightly Review*, January 1866); *The T.-U. of England*, by the Comte de Paris (translated by N. J. Senior, 1869); and *The Conflicts of Capital and Labour*, by G. Howell (1878). See also STRIKES.

Trade-Winds. See WINDS.

Tradu'cianism (Lat. *traducianismus*, from *tradux*, a 'vine-layer' for propagation) is the theory which maintains that the soul, as well as the body, of each human being is propagated by the parents. It holds that by the single act recorded in Gen. i. 27 all mankind were created complete, both as to their spiritual and material nature, in the first pair, from whom they have been individually procreated and born. This view of the origin of the soul was first distinctly stated by Tertullian (q. v.); founded chiefly on St. Paul's argument in Rom. v. 12–19 (*cf.* 1 Cor. xv. 32, Eph. ii. 3, Heb. vii. 10, Ps. li. 5, Gen. v. 3), and from his time onward gained ground in the Western Church from its affinity with the prevalent doctrine regarding original sin. Greatly established by Augustine, disowned by the Schoolmen, and partially revived among Calvinists and Lutherans, T. has received little attention for the last two centuries.

Trafal'gar, Cape, a Spanish headland on the Atlantic Ocean, near the Straits of Gibraltar, off which Lord Nelson (q. v.), with 31 ships, gained a memorable victory over the combined French and Spanish fleet, October 21, 1805.

Trag'acanth. See GUM.

Tra'gedy. See DRAMA.

Trag'opan (*Ceriornis*), a genus of *Rasorial* birds allied to the common fowls (*Gallinæ*), and inhabiting Tibet, Nepal, and the higher ranges of the Himalayas. The Horned T. (*Ceriornis Lathami*) is a familiar species, attaining the size of a large fowl. It is of a brown hue of varying shades and tints, speckled on the back with prominent white spots. The tarsi in the males are armed with 'blunt spurs,' and the head bears a prominent crest. The wattles of the males are very large and prominent. The tail is short and somewhat spare.

Train'-bands, a force partaking of the nature of both militia and volunteers, instituted by James I. in the place of the fyrd or general army of the population. It was dissolved by Charles II. The term was, however, applied to the London Militia, from whom the 3d Buffs were raised, till the middle of last century. John Gilpin, it will be recollected, was a 'train-band captain.'

Train'ing. The object of T. is to render the system of a person in good health capable of undergoing some unusual feat of exertion, and to increase the powers of endurance. By judicious T. 'a concordant action is established between the heart and blood-vessels, so that the strong action of the heart during exercise is met by a more perfect dilatation of the vessels, and there is no blockage of the flow of blood. In the lungs the blood not only passes more freely, but the amount of oxygen is increased, and the gradual improvement in breathing-power is well seen when horses are watched during T. This reciprocal action of heart and blood-vessels is the most important point in T.; the nutrition of nerves and muscular fibres improves from constant action and the abundant supply of food; the tissue changes are more active, and elimination, especially of carbon, increases. A higher condition of health ensues; and if not carried to excess, T. is simply another word for healthy and and vigorous living.' The rules that used to be laid down for making athletes were largely the product of crass ignorance and vulgar superstition. The restrictions in regard to the kinds of food and forms of exercise had no physiological warrant, and were little, if at all, better than quackery. The Englishman who has done most to abolish the absurdities and impostures connected with the subject is Mr. Maclaren, the teacher of gymnastics at Oxford, whose book, *T. in Theory and Practice* (Lond. 1866; 2d ed. 1874), is the standard authority on the subject. To it the reader is referred for details.

Train'ing Coll'eges, or **Nor'mal Schools**, institutions for the professional education of teachers, are widely distributed throughout Europe and the United States. The earliest establishment of the kind of which there is authentic record is the Institute of the Brothers of Christian Schools, founded in 1681 by the Abbé de la Salle, canon of the cathedral of Rheims. Little is known of its scope or action; but in 1697 August Hermann Francke founded in connection with his orphan school at Halle a 'teachers' class' of poor students, who assisted in the work of instruction in return for board and lodging. From this class, in 1704, he selected twelve pupils distinguished for 'piety, knowledge, and aptness for teaching,' and constituted them his *seminarium præceptorum*, the fame of which soon spread throughout Germany. Hundreds were attracted by the superior organisation and improved methods of Francke, and among his pupils were Johann Julius Hecker, who subsequently established similar institutions at Stettin in Pommern in 1735, and in Berlin in 1748. To promote the system, Friedrich the Great, the patron of Hecker, declared by royal ordinance that all vacancies in the crown-land schools should be filled by teachers trained in the Berlin seminary. Besides this he granted an annual stipend to twelve of the graduates, a number afterwards increased to sixty. Before long the seminaries at Rekahn, in Brandenburg, had eclipsed all others, and the system began to spread beyond the boundaries of Prussia. It found its way into Hanover in 1757, into Austria in 1767, into Switzerland in 1805, into France in 1808, into Holland in 1816, and into England in 1842. Since then it has been adopted in every country of Europe, with the solitary exception of Turkey, and teachers' training schools are now to be found not only throughout the British colonies, but in India, Japan, and the states of S. America. In 1875 there were 115 in Italy, 101 in Prussia, 73 in other German states, 104 in British India, 86 in France, 64 in Austria, 63 in Hungary, 45 in Russia, 41 in England, 33 in Belgium, 32 in Switzerland, 31 in Spain, 13 in British colonies, 10 in Sweden, 8 in Rumania, 7 in Norway, 6 each in Scotland and Portugal, 5 each in Holland and Denmark, 3 in Finland, and 1 each in Ireland, Luxemburg, Servia, and Greece. The first public normal school in the United States was opened at Lexington in 1839, and in 1876 there were no fewer than 137, with 1046 instructors and 29,095 students. Large as this number may appear, it is being rapidly increased, for at present the graduates do not amount to more than one-tenth of the number of teachers required for the common schools. In the United States the regular training schools are supplemented by 'Teachers' Institutes, which differ from the former mainly in being temporary although official bodies formed of those already holding appointments.

The Prussian system, which forms the basis of that of all countries, is characterised by organic completeness, by the combination of ample liberty with adequate restriction, and the satisfactory solution of 'the religious difficulty.' The course of instruction is for three years, and the training is of an essentially practical character, a notable feature being the prominence given to music. The subjects of study added to those in which a certain proficiency is ascertained by entrance examinations, are Latin, French, often English, botany, and pedagogy. In addition to the intellectual training, the students are instructed in certain industrial duties relating to the management of a household, garden, &c. The system in England reflects the main peculiarities of that of Prussia. A Committee of Education had stirred public interest by its report before the Liberal Government, and in 1839 appointed an educational Committee of the Privy Council, to which the House of Commons voted £30,000 for distribution. Mr. James Kay, afterwards Sir James Kay Shuttleworth, the secretary of this committee, after the committee itself had failed in an attempt to found a training college, succeeded in establishing such an institution without the aid of government. The various religious bodies followed his example, and within six years England had 15 training schools. This gave the denominational character to the system which characterises it to the present day. All training schools are under control of one or other of the Churches, and only one body—the Independents—took no distinct action except in founding and maintaining Homerton College. In 1846 the Committee of Council made the further step of establishing an elaborate system of inspection, with grants, and by 1859 these grants had increased to £836,920. In 1868 Mr. Lowe introduced the economical principle of payment by results, based on the new plan of individual examination, as opposed to the inspection of schools as a whole. He thought that Government should pay for the teaching of the three R's alone, and devised standards in these which scholars might be expected to rise to in one year. He assigned a money value for each of the subjects, and allowed to managers of schools a sum according to the number of passes gained by pupils in examinations. The essential merits of this plan have insured its vitality, in spite of its enmity to the higher branches, and its tendency to reduce instruction to a process of 'cramming.' The Code, the document containing regulations respecting the standards and passes, undergoes yearly changes. Since the passing of Mr. Forster's Act of 1870, the yearly grant appropriated in Parliament, and administered by the Education Department, is intended to maintain primary schools and training colleges for teachers. The recognised classes of teachers are (1) certificated teachers, (2) pupil-teachers, and (3) assistant teachers. Certificates are obtained on examination, which is open to students who have resided for at least one year in training colleges, and to candidates, over 21 years of age, who have either completed satisfactorily an engagement as pupil-teacher and obtained a favourable report from an inspector, or served as assistants for at least six months under certificated teachers. The certificates are of three classes, and are only granted after the candidates have served in probation as teachers. No certificate above the second class is originally issued; the third or lowest includes special certificates for teachers of infant classes. Good service alone entitles any teacher to a certificate of the first class. Those of the second class remain in force for ten years. A training college includes both a 'college for boarding, lodging, and instructing candidates' for elementary schools, and a 'practising school in which they may learn the exercise of their profession.' Annual grants are made to training

colleges, as to elementary schools; each college is entitled to £100 for every master and £70 for every mistress who, after two years' training, completes the prescribed period of probation and becomes qualified for a teacher's certificate, or who has completed a like period of good service as an elementary teacher in the army, royal navy, poor-law schools, or any certified industrial schools or reformatories. In 1878 the accommodation provided by the colleges in England under inspection was sufficient for 3157 students, and 3080 (1701 females) were in residence. They can turn out 1500 teachers yearly, and this would supply the average deficiency (6 per cent.) in a staff of 25,000 teachers. Besides these, a large number of candidates enter the profession by other channels recognised by the Code. The extent to which training colleges have operated in furnishing the existing staff is shown by the fact that of 11,135 masters and 13,706 mistresses examined in 1876, as many as 6746 and 6735 respectively had been trained for two years, 1195 and 1147 for one year, and 343 and 274 for less than one year. In 1877 the average salary in England of certificated masters was £115, and of mistresses £69; but in addition to salaries free residences were held by 5213 out of 10,694 masters, and by 4656 out of 13,103 mistresses. In Scotland the Code of 1873 introduced a provision allowing the combination of the training-college course with university attendance, and in 1878-79 no fewer than 130 normal school students were attending university classes, chiefly in the departments of mathematics, Greek, and English literature. In 1877 among those examined for certificates were 14 university graduates (22 in 1874). It was intimated in 1877 that a gradual reduction would be made from year to year in the number of students educated at public expense at Scotch training colleges, and that fewer Queen's scholarships would be awarded yearly. The Queen's scholars, it was resolved, would be limited to 700 (380 females) in the Church of Scotland and Free Church colleges, but My Lords have since 'agreed not to enforce for 1879 the full reduction of Queen's scholars which they propose eventually to make.' They allow 215 new scholars to be admitted from 1st January 1879 in place of the number (175) originally proposed. At Christmas 1878 the class-list of students in Scotch training colleges examined for certificates numbered 1043. Of these 190 (101 females) in Edinburgh, 190 (95 females) in Glasgow, and 78 (all females) in Aberdeen, attended the training colleges of the Church of Scotland, while 192 (106 females) in Edinburgh, 209 (128 females) in Glasgow, and 74 (all females) in Aberdeen, attended those of the Free Church. An Episcopal college in Edinburgh had an attendance in 1879 of 59 (all females). See Turner's *Educational Legislation* (Lond. 1876).

Tra'jan's Col'umn, a celebrated monument of Rome, and the *chef-d'œuvre* of Apollodorus, erected by the Roman senate and people in honour of the emperor in 114 A.D. It still stands in the Forum of Trajan, and is constructed entirely of marble. The shaft is 87 feet high, and whole, including pedestal and statue, 147 feet. Around the column runs a spiral band 3 feet wide and 660 feet long, covered with well-preserved reliefs from Trajan's war with the Dacians, comprising, besides animals, &c., 2500 human figures, the size of which, 2 feet below, gradually increases upwards. Beneath the column Trajan was interred, and on it was placed his statue, for which that of St. Peter has been substituted. A staircase in the interior of 184 steps leads to an open platform at the top. The reliefs, which are reproduced in casts preserved in the Lateran, are invaluable for the light they throw on Roman costume.

Tra'jan's Wall, a line of fortifications in the south of the Dobrudscha, extends from the Danube, at Czernavoda, to a point on the Black Sea, near Kustendji, a distance of 37 miles. It consists of a double (in some parts a triple) line of earth ramparts about ten feet high, bounded on its N. side by a natural fosse formed by a marshy valley, which was long erroneously regarded as an old course of the Danube. The wall was an important defence in the Russo-Turkish war of 1854, and the invaders were twice repelled in attempts to pass it—at Kostelli (April 10), and Czernavoda (April 20-22). A railway was constructed along the route in 1860, and the great cost has been the main obstacle to a project of carrying a ship canal across the valley for the purpose of avoiding the long and difficult passage by the Sulina (q. v.) mouth of the Danube. Another wall of the same name, constructed by a Roman legion 105-155 A.D., stretches from the Pruth E. to the Black Sea, and is included in the territory 'restored' to Russia by the treaty of Berlin, 13th July 1878. —**T.'s Pass** (Turk. *Demir Kapi*, 'iron-gate'), across the Ichtiman Mountains, between Sofia and Philippopolis, was occupied in the recent war by the Russians, 11th January 1878.

Traja'nus, Marcus Ulpius, was born at Italica, near Seville, September 18, 52 A.D. He was trained to arms, and in his early youth served with distinction in Germany and in the East. He became consul in 91, and was in 97, with the general approbation, adopted by Nerva as his successor. In January 98, on the death of Nerva, he became emperor, and signalised his accession by remitting the corn-duties and abolishing the odious function of the *delatores*. In 101 he set out against the Dacians, and during the next two years subdued their country and obliged their king Decabalus to accept his terms. In 103 he entered Rome in triumph, and in the following year began the second Dacian war, which ended in 106 with the death of Decabalus and the reduction of his country to the form of a Roman province. During this war T. built a permanent bridge across the Danube. On his return to Rome he enjoyed a triumph and exhibited games for 123 days. He now devoted himself to the construction of great public works, made a road across the Pontine Marshes with *mansiones* at intervals, great military roads throughout the whole empire, with magnificent bridges over the rivers, and an artificial harbour at Centum Cellæ (Civita Vecchia). His chief works in Rome were a theatre and several public libraries, among these, the *Ulpia Bibliotheca*, and the great Forum Trajanum, in the centre of which stood Trajan's Column (q. v.). In 114 he set out against the Armenians and Parthians, wintered at Antioch, and in the following summer invaded Parthia, overran the whole country in two campaigns, and took Ctesiphon the capital. In 116 he descended the Tigris and sailed down the Persian Gulf. Meanwhile a revolt of the Parthians had been subdued by his generals, and T. on his return placed Parthamaspes on the throne. In 117 he began to sink from a combination of dropsy and paralysis, and accordingly set out for Rome, but died on the way at Selinus in Cilicia (afterwards called *Trajanopolis*), August 11, 117, after a glorious reign of 19½ years. T. was the second in the series of good emperors which included Nerva, Hadrian, and the Antonines. Though the bent of his mind was for war and great works, he thoroughly reformed the finance and purified public justice, while under him the provincials enjoyed a mild government and the Christians a respite from severer persecution. See Francke, *Zur Geschichte T.* (Quedlinb. 1840), Dierauer, *Beitrage zu einer Kritischen Geschichte T.* (Leip. 1868), and C. D. La Berge, *Essai sur le Règne de T.* (Par. 1877).

Trajec'tory, in dynamics, is the path described by a body, such as a planet, comet, projectile, &c., under the action of given forces. In geometry the name is given to a curve or surface which cuts all the curves or surfaces of a given system at a constant angle. When this angle is a right angle, the T. is then called an orthogonal T. Loxodromic lines may be cited as examples of a T. upon the surface of a sphere, cutting all great circles at the same angle. The logarithmic spiral is the T. of a plane pencil of rays through its pole, and a circle is the orthogonal T. of the same.

Tralee' (Ir. Gael. *Traigh-Li*, 'the strand of the Lee'), a town at the mouth of the Lee, on the W. coast of Ireland, 22 miles N.W. of Killarney by rail. It is well built, and the four principal streets, which are wide, meet in a small square. Two Roman Catholic, an Episcopalian, and several other churches, a town-hall, court-house, barracks, and infirmary are the chief public buildings. There are monuments to the Kerry men who fell in the Crimea and in India. A considerable provision trade is carried on. In 1877, 588 ships of 78,697 tons entered and cleared this port; the customs revenue, which is gradually decreasing, was £3167; the imports were valued at £165,379. Pop. (1871) 9506, of whom 8563 were Roman Catholics, and 746 Protestant Episcopalians.

Tramm'el-Net (Low Lat. *tramallum* or *tramela*, from *tres maculæ*, 'three meshes'), a fishing net, of which there are two kinds. That used in the S. of Ireland resembles the ordinary drift net in depending perpendicularly in the water and entrapping the fishes by the gills in the meshes, but it is prevented drifting with the tide by means of anchors and weights; hence in other

parts of the United Kingdom it is known as a *Set-Net*. The real T.-N. is found on the S.W. coast of England and in the Channel Islands. It consists of three long nets set parallel and fastened together at the edges, the centre one being much larger than the other two, so that there is much slack netting. A fish may pass easily through the large meshes of either of the 'wallings,' but in doing so it encounters the inner net, which is fine-meshed, and drives a portion of the slack netting through the opposite large mesh, thus forming a bag or pocket in which it becomes 'trammeled.'

Tram'way. A T. consists of a narrow, smooth, continuous track, prepared to form a course in which the wheels of any carriage or waggon, having the gauge of the two parallel lines, may run more smoothly and with less friction than on the surface of an ordinary road. The term T. is corrupted from Outram, the name of an engineer who, towards the end of last century, constructed such wheel-tracks in connection with colliery and other mine-roads in the N. of England. The system is, however, of much earlier origin, continuous wooden tracks having been used in connection with Newcastle collieries more than two centuries ago. About 1765 a development of the system occurred when cross-sleepers were laid under the longitudinal planks, which were then raised above the level of the roadway, and, to keep the waggons on the track, the wheels had fixed to them a flange or projecting rim. In 1767, during a period of commercial depression, the Coalbrookdale Company laid down a track of cast-iron instead of wood, with the intention of taking it up and selling it at a subsequent period, and this really formed the first iron railway, the prototype of all railways as well as tramways. At a later date rail-plates were cast with a flanged edge, so that the guiding flange was transferred from the wheel to the rail. Thereafter many different modifications of both rails and wheels were devised till the forms now generally adopted were evolved. In 1809 a T. or horse railway was projected between Cheltenham and Gloucester, and subsequently an Act of Parliament was obtained, and a line opened for passenger traffic in 1821. The system, however, of street tramways, as now established, with grooved rails and flanged wheels, was first proposed by a French engineer, M. Loubat, in America, and was there carried out in many of the principal towns. In several Continental towns also the T. system was introduced before it began to attract much attention in the United Kingdom. In 1857 or 1858 an eccentric American—George Francis Train—made proposals for laying T. lines in various metropolitan thoroughfares and in several provincial towns. In 1861 an experimental line was laid down by Train in London, but it became the subject of bitter controversy and lawsuits, and after a short existence had to be removed. A similar fate would have befallen Train's lines at Birkenhead and Hanley, had the objectionable rail used by him not been withdrawn and a better form substituted. In 1868 an Act of Parliament was passed sanctioning the laying down of T. lines in Liverpool; in 1869, after severe contests, three local Acts were passed for London, and since that period the formation of tramways has been sanctioned and carried into effect in all the very large towns in the United Kingdom. On 30th June 1878 there were throughout Great Britain 268 miles of T. and 346 authorised; 9222 horses employed, and 1124 cars. The gross receipts of the financial year were £1,145,465; the working expenses, £868,315; and the capital expended, £4,207,350.
The use of some form of mechanical power on T. lines in place of horses is a subject which has attracted a great amount of attention, and several kinds of road steamer have been suggested and introduced. The heat generated, the noise, and the appearance of the exhausted steam of the engines, have, however, been the most serious obstacle to the use of steam-power on roadways used for ordinary carriage traffic. To overcome these difficulties Mr. Scott Moncrieff, of Glasgow, proposed the use of highly-compressed air, and he devised an apparatus by which a loaded car could travel several miles with one charge of compressed air. A 'fireless locomotive' invented by Emile Lamm has met considerable success in the United States. In this machine the boiler is charged from a stationary boiler with water superheated to 380° F., whereby an initial steam pressure of 170 lbs. is obtained. Messrs. Merryweather & Sons, of London, have attained very considerable success in the adaptation of engine power to the haulage of T. cars, and upwards of sixty engines made by that firm are in use in various Continental cities. Steam-power has for several years been in use on the Vale of Clyde tramways at Govan, a suburb of Glasgow, the engine being enclosed within a small separate car which draws the passenger car, thus presenting the appearance of two cars, a smaller and larger running together. The engines now in use were constructed by Hughes of London, and the noise is so slight, and the smoke and fire are so little seen, that no complaints of frightening horses have arisen in connection with the working of the lines by this form of mechanical power. Mekarski's T.-Car, in which heated compressed air is the motive power, has been successfully run on the tramways of Paris. See Dowson's *Construction and Working of Tramways* (Lond. 1875).

Trance, or Mor'bid Sleep, is a condition closely allied to sleep, but differs from it as regards duration and profound insensibility to external impressions. *Death T.* is, according to Dr. Mayo, a positive status; a period of repose, the duration of which is sometimes definite and predetermined, although unknown. 'The basis of death-T. is suspension of the action of the heart, of breathing, and of voluntary motion; generally, likewise, of feeling and intelligence; and the vegetative changes in the body are suspended. With these phenomena is joined loss of external warmth, so that the usual evidence of life is gone.' Regarding this hypothesis, Dr. Taylor says:—'It is obvious that the writer makes no distinction between life and death. All the ordinary phenomena of life may have ceased, and yet, if from any circumstance the decomposition of the body has been retarded, it may be contended that the body is not dead, but simply in a death-T. The entire absence of the ordinary signs of active life is sufficient, according to this physiologist, to prove the absence of life—a proposition which may be granted in reference to a *few hours* of time, but it would be unreasonable to adopt this method of inquiry, and judge of death by the presence of *one* sign only, instead of taking these signs in their totality and ordinary sequence.' There are no well-authenticated cases on record in which T. has simulated death for any length of time. See CATALEPSY and HYSTERIA.

Tra'ni, a town of S. Italy, province of Bari, on the Adriatic, 95 miles W.N.W. of Brindisi by rail. It is an archbishop's see, has a cathedral, built about 1100, with a Romanesque portal and bronze doors of 1175, the fine church Sta. Maria Immaculata, several convents, a castle, a theatre, an orphanage, a high school, a technical school, and a priests' college. T. has important fisheries, and considerable trade in oil, corn, almonds, figs, and excellent wine ('Moscado di T.'). The harbour is to some extent sanded up. T. is the ancient *Turenum* of the Peucetii, and was in the Middle Ages an important seaport. It was taken and burnt by the French in 1779. (Pop. (1874) 24,388.

Tranquebar', a small town in the district of Tanjore, Madras Presidency, British India, on the Coromandel coast, at the mouth of one of the arms of the Cauvery river. It was originally a Danish settlement, founded as early as 1617, but was ceded to the British in 1845 for a money consideration. In its castle of Dansborg, the European architecture of all its houses, and the cleanness of its streets, it recalls its founders. The manufactures and trade are inconsiderable, but T. is celebrated as the first home of missionary effort in India. In 1706, under the patronage of Frederik IV. of Denmark, the missionary Ziegenbalg arrived, who translated the New Testament into Tamul. In after years came the respected Schwartz; and numerous churches still flourish under Lutheran and English episcopal direction.

Transbaika'lia, a province of the Russian Empire, E. Siberia, lying S. and E. of Lake Baikal (q. v.). Area 240,774 sq. miles; pop. (1873) 447,568, among whom more than a third are heathen Mongols, Tungusians, &c. T. is a diversified mountain-land, richly wooded, with fine pasturage. Its metallic wealth is great, consisting of silver, lead, gold, copper, tin, coal, and asphalt. The centre of the mining industry is Nertchinsk (q. v.), the chief town is Tschita (q. v.).

Transcauca'sia, the part of Asiatic Russia lying S. of the Caucasus, between the Black Sea and Caspian. See CAUCASUS.

Transcen'dent, or Transcenden'tal (Lat. *transcendo*, 'I go beyond'), is a philosophical term meaning that which lies beyond sense or experience. The Schoolmen called that which could not be embraced under the ten categories of Aristotle, T. In Kant (q. v.) the philosophy of T. elements of knowledge are the *à priori* factors not contained or derivable from, but regula-

tive of, experience. In ordinary language T. is often used (not quite correctly) to mean something apart from ordinary subjects. Thus the poetry of Shelley is called T., and by this is probably meant that it deals with elevated and unusual moods of thought and feeling. See A. J. Balfour's *Transcendentalism* in '*Mind*' (October 1878).

Trans'epts, in cruciform churches, are the wings or cross-aisles projecting N. and S. from the eastern end of the nave.

Transforma'tion. See METAMORPHOSIS OF ANIMALS.

Transfu'sion of Blood is a surgical operation by which blood is conveyed directly from the body of one person to that of another. The earliest case of T. of B. on record is that of Pope Innocent VIII., who was unsuccessfully operated on in April 1492. Various experiments were afterwards made by Wren and Lower in the T. of B. from one animal to another, and by Denys of Montpellier in injecting the blood of calves into human subjects; but the experiments were not attended with any great success, so that the operation fell into desuetude. This was in great measure due to the fact that the experimenters supposed that, by the T. of B. of healthy subjects or of the inferior animals, into the veins of the diseased and enfeebled, disease would be expelled and life prolonged. It was not till about the year 1824, when Dr. Blundell published his work on *Physiological and Pathological Researches*, that the T. of B. was regarded as a legitimate operation in obstetric surgery; and at the present day the operation is chiefly restricted to cases of profuse hæmorrhage in connection with labour, though it is sometimes practised in cases of sudden and profuse hæmorrhage from other causes. Cases of intermittent fever have been treated by transfusion in foreign countries, but without any very encouraging results. The operation is best performed by taking blood, instantly before injection, from the arm of a healthy person; but Dr. Brown-Sequard has shown that the blood of various animals can be used indiscriminately, provided only certain precautions be taken; and Professor Panum has made the important discovery that defibrinated blood is in every respect as well suited for the operation as pure blood. Lately, Mr. Wagstaffe has used milk, and milk mixed with an equal quantity of defibrinated blood, for injecting into the veins. Instead of blood, the following saline solution has been recommended by Dr. Little for injection:—Chloride of sodium, 60 grs.; chloride of potassium, 6 grs.; phosphate of soda, 3 grs.; carbonate of soda, 20 grs.; distilled water, 20 oz., the solution being injected at blood-heat. See *Obstetric Society's Transactions*, vol. vi. May 4, 1874; *Medical Times*, September 5, 1874.

Tran'sit In'strument, an instrument mounted so as to observe the meridian passage of a star. It was invented by Rœmer, the famous Danish astronomer, about the year 1690, and is described in the *Miscellanea Berolinensia*, tome iii. 1700. Halley erected one at Greenwich Observatory in 1721, but it was little used till 1742, when Bradley began his regular meridional observations. In 1861 Troughton set up a larger and improved instrument, which was superseded in 1850 by the large transit circle now in use. The T. I. consists essentially of a telescope movable only in the meridian plane. Though primarily intended merely to *time* the passage of a star, the obvious addition of a graduated circle makes it available for altitude measurements. The great essential of such an instrument is that it moves accurately in the plane of the meridian. It must therefore be fixed at right angles to a horizontal axis, which rests in a stable frame so as to lie due E. and W. It is impossible in practice to have these conditions accurately fulfilled, and the errors of adjustment must be known and allowed for before the readings of the instrument can be trusted. The three principal errors to which a T. I. is subject are (1) the *error of collimation*, due to the optical axis of the telescope not being at right angles to the axis of rotation; (2) the *error of inclination*, due to the axis not being level; and (3) the *error of azimuth*, due to the axis not being E. and W., or to the optical axis not being in the meridian plane. See Herschel's *Astronomy*, and Loomis' *Practical Astronomy*.

Transi'tion Rocks, a term now disused, which was applied by the older geologists to those formations which seemed intermediate between the so-called 'Primitive rocks,' such as granite and gneiss, and the ordinary stratified rocks, which were called 'Secondary' or 'derived.' The T. R., which were also classed under the vague name of grauwacké, now enter into the Cambrian and Silurian formations. Geologists still, however, apply the term in a general sense when describing any beds which, lying between two formations, partake of the characters of both, and indicate a gradual passage from one to another: *e.g.*, the Llandovery Rocks, between the Lower and Upper Silurians.

Transmigra'tion, or the supposed passing of the soul into another body at death, is a belief which, as an instinctive conception, has been almost universal among barbarous and half-civilised tribes, from the ancient Gauls to the Tasmanians of the present day, and from Mexico to Tibet. As a speculative theory it has had a place in the philosophy of all time. It is one of the cardinal doctrines of the Vedas, the oldest literature of India; and it held a prominent place in the ancient religions both of Persia and Egypt. Some of the Essenes and Pharisees among the Jews held the doctrine, which, in their case, was probably of Persian origin. Not a few of the older Greek philosophers—*e.g.*, Pythagoras, Empedocles, and Plato—held it; and through the Neo-Platonism of Alexandria it found its way into the Christian church, and was accepted by some of the Patrists, *e.g.*, Origen, as well as by the heretical Gnostics and Manichæans. Though condemned by the Council of Chalcedon (551), it kept a certain hold on Christian theology, and re-appeared among the Schoolmen. It has been praised by English divines and poets, and among modern philosophers has been advocated by Hume, Lessing, Herder, Fourier, Leroux, &c.; and it remains the creed of all the millions of Buddhists.

There are three possible forms in which the doctrine may be held—1. That it extends to all forms of life, so that the highest may change places with the lowest, and *vice versâ*. Certain obvious facts of experience might give rise to this belief: (1) the superficial resemblances in feature, disposition, and character between men and the lower animals might suggest that the bodies of animals were inhabited by human souls, and those of men by animal souls; (2) physical, mental, and moral features re-appearing in families after an interval of generations might induce the supposition that an ancestor had returned to life; (3) thoughts and sensations which cannot be traced back to any source in past experience might seem to warrant the inference of the soul's pre-existence; as it is expressed in Indian philosophy, 'joy, fear, and grief arise to him that is born, through relation to his memory of things previously experienced.' 2. A second theory of T. is that which would limit it to the animal world, denying it to the human. 3. The third form is that the T. may apply both to the human and to the animal world, but that the souls of men never descend below the human level, while those of animals never ascend into the human form. The philosophical grounds on which T. has been maintained are threefold:—(1) The first, which was forcibly stated by Plato, is our knowledge of ideas which are not the product of experience. If these be latent in the soul at birth, they must have come from a previous state of existence. (2) Some philosophers have found in T. the key to the unequal adjustment of happiness and misery in the present life; without it, they say, it is impossible to 'vindicate the ways of God to man.' (3) Applying the doctrine of the conservation of energy to the sphere of spiritual life, it is argued that the number of souls in the universe must be fixed and constant. If the amount of spiritual existence is not increased, the pre-existence of all souls is as certain as their immortality.

Tran'som, in architecture, the horizontal mullion or cross-bar of a window, rarely found in the Early English, oftener in the Decorated, most frequently of all in the Perpendicular style.

Tran'som, in artillery, a strong bar formed of timber connecting the two corresponding parts of a gun-carriage. The length of the T. regulates the width of the vehicle. Wooden siege-carriages are connected by three transoms. Transoms in ships are the beams bolted across the stern-post.

Transplanta'tion of Tissues. Modern surgery has, within recent years, been very fertile in numerous discoveries, and especially as regards the T. of T. Professor Nussbaum of Munich, in 1875, described a new operation for the loss of bone which he denominates *transplantation of bone*. It consists of cutting off from the rest of the bone a portion of its external shell, covered by the periosteum, and leaving this shell of bone attached to the remainder by means of the periosteum covering its terminal extremity. This semi-attached bone is displaced into the gap in the same way as a flap of skin is twisted in a plastic

operation, and fixed in the indurated soft tissues of which the gap is formed. The operation was first performed in a case of non-union of the ulna, the result of loss of bone from a gunshot fracture. Attempts have also been made to *transplant* periosteum which may form the nidus of bone. The transplantation of skin may be effected by displacement, or by torsion. The first mode is effected by dissecting up a piece of skin, of the required size and shape, a portion of it being left attached. The loose portion is then shifted into the part where it is intended to lie. In the method by torsion, the position of the flap of the skin is changed, and the neck of skin, forming the attachment, is made as slender as is consistent with the maintenance of vitality. In both cases the edges of the transplanted skin are brought into close contact by means of stitches, with the cut edges of the skin where union is desired. Transplantation of skin can be effected from one part of the body to another, as from the arm to the nose, or from the thigh to the hand. *Transplantation of skin*, by grafting, was invented by M. Reverdin of Geneva in 1869, and was introduced into British surgery by Mr. Pollock in 1870. This operation is peculiarly adapted to cases where large granulating surfaces are exposed, as in cases of extensive burns. It is essential that the granulations should be perfectly healthy, and that all irritation in the sore should have ceased. The operation may be performed with a pair of fine forceps and sharp curved scissors. A small portion of skin, hardly larger than a pin's head, is snipped off with the scissors. The whole thickness of the skin should not be cut through, but only a small portion of it, so as to make sure of removing the *rete mucosum*, as the growth of the graft seems to depend on the cells of the *rete Malpighii*. The grafts are placed firmly on the granulations, about an inch apart, and are covered with oiled silk, moistened with oil to prevent its sticking when removed, and the whole is fixed with strapping and covered with cotton wool. The dressing should be renewed in three or four days. The grafts first change into little, round, vascular-looking buds; and in a short time the new cuticle is seen extending in all directions from the bud. That the new skin is due to the graft is evident from the fact that a graft from a negro placed on a European produces a dark-coloured skin; and a graft from a European transplanted on a negro produces a white portion of skin. Very recently T. of T. has been introduced into dental surgery. See Dr. Page in *British Medical Journal*, March 27, 1871.

Transplant'ing is taking up a plant with its roots and replanting it again in such a manner that it shall continue to grow. As applied to horticulture, it consists in the removal of small plants from one bed to another, for the purpose of increasing their growth, and does not call for any special notice here. The following remarks are therefore limited to T. in its application to arboriculture, or the removal of large trees, whether for ornament, shelter, or for screening unsightly objects. The art was not unknown to the ancients, as is shown by the writings of Pliny, Seneca, &c., but was carried out on no fixed principles. It first came into practice in England about 1550. T. on a gigantic scale was undertaken by Louis XIV. of France, who transferred from Versailles most of the large trees in the Bois de Boulogne. The machines in use at this early period were unwieldy and complicated, being constructed to carry the trees in an upright position; and the trees, both head and roots, were much mutilated. Early in the present century the system of selection and preparation in T. large trees was reduced to scientific principles by Sir H. Stewart of Allanton, N.B. Successful T. is dependent upon several conditions, of which the most important are:—1. Selection of proper trees and their adaptation to the soil. As a rule, none should be chosen for a poorer soil than that from which removed, but much may be done by a liberal use of composts, by drainage, trenching, &c. 2. A careful preparation of both trees and soil, by cutting a trench around the tree, filling with good composts, and leaving for two to four years for proper root-growth to take place. 3. The time and method of removal. For deciduous trees late in autumn is the best time; much care is necessary to loosen the soil among the roots. After the tap-root is severed the T.-machine ('janker') is brought alongside, the tree is lashed firmly to the pole, and, by means of the leverage so obtained, is brought into a horizontal position, after which horses are attached, guide-ropes applied, and with roots carefully packed up and protected, removal is made to the new site. 4. The manner of fixing and disposition of the roots. The soil upon which which the tree is lowered should be thoroughly consolidated, the roots should be feathered out to avoid crossings and interlacings, and finely pulverised soil must be interspersed in small quantities at a time. 5. After-treatment. The surface, under which the roots spread, should be well covered to promote consolidation and to prevent evaporation. Ramming during the first spring is serviceable, and liberal waterings in the summer months.

Trans'port, the conveyance of troops and of everything necessary for their support and armament by land or sea. Water is the cheapest and most convenient means of T. The insular position of this country and its military relations with every part of the world has necessitated the use of a large number of T.-ships. In the admirably constructed and commodious vessels sailing between Portsmouth and Bombay 270 tons are required for every 100 men. Navigable rivers in a foreign country are easy for T., but they are seldom available for the conveyance of troops to the front of positions. Waggons and military carts are attached to all armies to carry stores from the principal magazines to those at different stages on the line of march, and carts carrying a certain number of days' rations are attached to each division. There is also a regimental T. for the conveyance of light baggage and camp equipments. A two-horse waggon can draw 800 lbs., a four-horse waggon 1800 lbs., and a six-horse waggon 3300 lbs. Wheel T. on a good level road is about five times more servicable than pack T., but in a very hilly and rough country the latter must be resorted to. All the procurable carrying animals of the district are then pressed into the T. service. A mule will carry upwards of 200 lbs. in a level country and 100 in a mountainous country, a bullock about the same amount, a camel twice as much, and an elephant 15 to 20 cwt. in a level country, and 10 to 12 cwt. in a mountainous country. Railways are invaluable where they can be used on a large scale, as in the Franco-Prussian War, where the Germans had direct railway communication from their own country to Paris. Two trains of about thirty-four carriages each, propelled by single engines at the rate of from 20 to 25 miles an hour, will convey an infantry battalion of 1100 men with their equipments, or a battery of horse-artillery or field-battery with men, horses, and equipments. One similar train will convey a squadron of cavalry. The T. of a division of the English army would require twenty-six such trains, and of a full army corps 144 trains. The T. department of the English army is a subdivision of the control department. In time of peace it is employed in the conveyance of commissariat supplies, and on public works, arsenals, &c.

Transporta'tion, Legal. See PENAL SERVITUDE and TICKET OF LEAVE.

Transpose' (in music). To T. is to alter the key of a musical composition either into a higher or lower scale. It is a useful exercise for students, as a new key often requires a new position of chords, and calls ingenuity in part-writing into requisition. *Transposing instruments* are those which produce a different pitch of notes from those written. A *transposing piano* is a pianoforte with a movable key-board by which the pitch of the instrument can be altered.

Transubstantia'tion (Lat. 'a change of substance') was a name first made use of to denote the change of the Eucharistic elements of bread and wine into the body of Christ in the beginning of the 12th c. The earliest Schoolmen had maintained the doctrine in a way, employing similar phrases, *e.g.*, *transitio*; and as the doctrine of the Mass (q. v.) was gradually developed, it was finally distinctly stated (first by Anselm of Canterbury) that the whole Christ was present both in the bread and the wine. The doctrine was now solemnly confirmed by being inserted in the Gratiani Decretum (q. v.), and by a General Council (Lateran IV., 1215) under Innocent III.; although a manifold controversy arose on the point. At the Reformation, the Reformers, while differing widely in their opinions regarding the doctrine of the Lord's Supper (q. v.), one and all opposed the doctrine of T., as well as the notion of the sacrifice of the mass. The doctrine of T. is to be distinguished from that of the Real Presence (q. v.), inasmuch as the latter may, and is generally understood to mean that the body of Christ co-exists in and along with the elements, whereas according to the doctrine of T. the body of Christ takes the place of the elements, only the appearance of the latter remaining.

Transvaal' ('across the Vaal'), a British territory in S.E. Africa, bounded on the N. by the river Limpopo (q. v.), on the E. by the Lobombo range and Zululand, on the S. by Natal and the Orange River Free State, and on the W. by the Kalihari Desert and Bechuanaland. Its greatest length from N. to S. is 425 miles, its greatest breadth from E. to W. 375 miles, and its area 120,000 sq. miles. The country is a plateau sloping inland from the mountains forming its eastern frontier, whose height is 7000 feet, and whose seaward face is abrupt and precipitous. The centre of the T. is traversed by several ranges running at right angles to the main chain, the chief being the Magaliesberg, which forms the watershed of the Vaal and Limpopo systems, and has an average height of 5000 feet, with peaks rising to 9000 feet. Physically the T. consists of three great divisions, known as the High, Terrace, and Bush country respectively. The first has an area of about 40,000 sq. miles, and is an elevated, well-watered region, well adapted for grazing and agriculture. The second lies along the mountain slopes, and has an area of 20,000 sq. miles. It is well wooded, and its pastures feed large herds of cattle. The Bush country has an area of 60,000 sq. miles, lies lower than the other two divisions, and in its northern part has a tropical climate. Its grass, though excellent fodder in winter, is too rank for domesticated animals in summer. Under irrigation, fruit-trees, the sugar-cane, coffee, indigo, and tobacco thrive, and wheat also, as a winter crop. The large game, once common everywhere, have now retired to the remoter parts of this region, where lions, rhinoceroses, &c., are still to be met with, and crocodiles infest the rivers. Taken as a whole, the T. is a fertile country, well adapted to the cultivation of most tropical and semi-tropical crops. Its wheat, in particular, is of the finest quality, and has already earned for the T. the title of 'the granary of South Africa.' Sheep, cattle, and horses thrive, except in districts infested by the dreaded Tsetse Fly (q. v.); but as the winter is also the dry season, it is necessary to move the flocks and herds when the pastures become bare. The remedy for this lies in a system of irrigation. N. of the parallel of 25° S. lat., fever is common, but elsewhere, and especially in the more elevated districts, the country is remarkably healthy. The mineral wealth of the T. is very great. Rich gold-fields, both quartz and alluvial, are worked at Leydenburg, Marabastad, and Blaaubank, and silver, copper, cobalt, and plumbago are found in many places. Iron and lead are very plentiful, and coal of the best quality abounds almost everywhere. The great lack of the country is a port, as it is 100 miles from the sea at the nearest point, and its trade is therefore carried on through Natal or Delagoa Bay. A railway from the latter to the Leydenberg gold-fields has long been projected, but through Portuguese supineness is not yet commenced. News, however, was brought by the Lisbon mail (December 1878) that the Portuguese government had at last agreed to join the English government in constructing a railway between Lorenzo Marquesas on Delagoa Bay and the T., the cost of which was estimated at £350,000. The capital of the T. is Pretoria (q. v.), but it is rivalled, if not surpassed, by Potchefstroom, 90 miles to the S.W., in a lovely district. The white pop. of the T. was estimated in 1877 at fully 40,000, and the native pop. at 250,000, but the latter is a purely conjectural figure. The natives are inferior to their neighbours the Zulus in physique, but are more inclined to industrial pursuits.

The earliest settlers in the T. were the Boers (q. v.), who crossed over from Natal and established a republic in 1840, their leaders being Maritz, Potgieter, and Pretorius. The republic was acknowledged by Britain at the Sound River Convention, signed on 17th January 1852, and existed till 12th April 1877, when the T. was annexed to Cape Colony, on the ground that the native policy of the republic threatened to bring about a general Kaffir rising in S. Africa. The annexation was protested against by the Volksraad or Parliament of the T., and in spite of it a native rebellion broke out in January 1878, and is still (Feb. 1879) unquelled. See Silver & Co., *Handbook to the T.* (Lond. 1877); Noble, *South Africa, Past and Present* (Lond. 1877); Trollope, *South Africa* (Lond. 1877); Gilmore, *The Great Thirst Land* (Lond. 1878); Harriet Roche, *On Trek in the T.* (Lond. 1878); Aylward, *The T. of To-day* (Lond. 1878), and General Sir A. T. Cunynghame, *My Command in S. Africa* (Lond. 1879).

Transylva'nia (Ger. *Siebenbürgen*), a grand-duchy and crown-land of the Austro-Hungarian monarchy, surrounded by Hungary, the Bukovina, Moldavia, and Wallachia. Area, 21,216 sq. miles; pop. (1870) 2,115,024. T. is so called from its position beyond the wooded Carpathians; its interior is a table-land intersected by spurs from the Carpathian ranges, rising in the S. (in Negoi) to 8060 feet, in the N. to 7000, in the W. to 5840, and in the E. to 5700, while its average elevation is about 1500 feet above the sea, its lowest point being where the river Maros enters Hungary (566 feet). The chief rivers, all belonging to the Danube system, are the Aluta, falling into the Danube, Samos, and Maros (tributaries of the Theiss), and the Bistritz, an affluent of the Sereth. Of the whole area, 23 per cent. is arable, 25 per cent. meadowland, and 38 per cent. forest. The best wine is produced in the valleys of the Samos, Kotel, and Maros. In 1877 the yield per sq. kilogr. of beet-root was 122·55 kilogr.; of tobacco, 85·76 kilogr.; and of flax and hemp, 490·86 kilogr. The mining industries of T. are directed by the 'Captainship of Zalatna,' and included (1875) the production of 34,614 metric tons of iron ores, and 16,774 of pig-iron (produced by 15 blast-furnaces). Other mineral products are gold, silver, quicksilver, copper, coal, and salt. Tanning and the manufacture of linens, woollens, and glass, are also important. Originally a part of Dacia, T. was conquered by King Stephan I. in 1004, and united to Hungary. About this period the country was invaded by Germans, probably from the Rhine districts, who named it *Siebenbürgen*, after the seven fortified towns built by them. Ever since this little Saxon colony has retained, unchanged, its peculiar laws and language, there we find cities with names like Kronstadt, Hermanstadt, Klausenburg, Elizabethstadt, and Muhlenbach, in a district surrounded by places with Slavonic, Magyar, and Wallachian names. From 1526 to 1699 T. was an independent kingdom under the Zapolya princes. Completely subdued by Leopold I. in 1687, and united to Hungary in 1713, it became a grand-duchy in 1765. In 1848, T. was the theatre of a bloody struggle between Bem and the Russians, and was for a time united to Hungary. Since 1849 it has been an independent crown-land. See Professor D. T. Ansted, *A Short Trip to Hungary and T.* (Lond. 1862); and C. Boner, *T., its Products and its People* (Lond. 1865).

Trap, a name rather loosely and vaguely applied to a great number of rocks of volcanic origin, which can be easily distinguished on the one hand from the granites, and on the other from the aqueous or fossiliferous rocks. T. is liable to almost infinite variation, just as in recent lava-streams hardly any two are to be found of identical composition, and the more important subdivisions of the class—*e.g.*, amygdaloid, basalt, greenstone, and porphyry—have been already described. The name T. (from Swedish *trappa*, 'a stair') was proposed by the mineralogist Bergmann, owing to the terraced or step-like arrangement which may be traced in many of these igneous rocks.

Tra'pa, a small genus of *Onagraceæ* occurring in central and S. Europe, tropical Africa, and eastwards through Asia. All are floating herbs. Of the European *T. natans*—water caltrops, or water-chestnut—the farinaceous seeds are collected in Italy, &c., and eaten raw, or ground into flour and made into bread. The plant is also cultivated for this purpose. *T. bispinosa*, the Singhari nut of India, forms in Cashmere and other districts an important staple article of food. *T. bicornis*, the Leng or Ling of China, is regularly cultivated in lakes and ponds by the Chinese, and is brought extensively to market.

Trapa'ni, a coast town in the W. of Sicily, 23 miles W. of Palermo. The *Cattedrale S. Lorenzo*, a town-house, a lyceum, and a library are the chief public buildings. The town is well built, strongly fortified, and has a good natural harbour. The manufacture of sea-salt is the chief industry, but corn, wine, fish, and coral are also exported. In 1874, 174 vessels (52 British) of 55,327 tons entered and cleared. The imports and exports fluctuate greatly; the former in 1874 rose from £3537 in 1873 to £18,180; while the latter fell from £55,238 to £16,126. Pop. (1876) 36,045. T. is the ancient *Drepanum* or *Drepana* (Gr. *drepanē*, 'a sickle,' so called from the shape of the adjoining promontory). It was fortified by Hamilcar in 260 B.C., and here in 249 Adherbal defeated the Roman fleet. Near it is Mount Eryx, now *Monte S. Giuliano*. Important discoveries of human and other bones in caves were made in 1869.

Trape'zium is a Quadrilateral (q. v.), no two of whose sides are parallel. When only two are parallel, the figure is called a *trapezoid*, and must be plane.

Trapézoid, the smallest bone of the second row of the wrist bones, of which there are eight in man. It is wedge-shaped, the broad end or base lying next the arm. Above, the T. articulates with the *scaphoid* bone of the wrist, and below, with the palm-bone of the first finger or that next the thumb. It also articulates with the *os magnum* and the *trapezium*, a bone of the lower row of the carpus or wrist, to which the thumb is specially attached.

Trapp'ist Order, or the Reformed Bernardines of La Trappe, was in a sense a new order of monks founded (1664) by Armand de Rancé (q. v.), but was properly a reformed community of Cistercians (q. v.). Abbot of the Cistercian monastery of La Trappe, the discipline of which had become extremely lax, Rancé was arrested, about the year 1662, in a thoughtless and luxurious life, by some circumstances of which various romantic accounts have been given, and, setting the example himself, he introduced into the monastery a system of excessively austere discipline. The time of the monks, who had to live entirely on bread, vegetables, and fruit, was divided between manual labour, the canonical exercises, and private devotions. Their conversation was confined to the greeting *Memento mori;* their worship was kept up day and night; and if a monastery contained as many as twenty-four monks they were divided into three classes, which interchanged duties continually. For a time the order was confined to France. Being dispersed at the Revolution, they found a home in Switzerland, Italy, Spain, America, and England. After the restoration of the Bourbons they obtained possession of their old house of La Trappe, which still remains the head monastery of the order. About 1840 a branch of the T. O., with a modified organisation, and under the name of 'Trappist Preachers,' was established at Pierre-qui-Bire, near Avallon. See Gaillardin, *Trappistes* (Par. 1844), and Pfannensch, *Geschichte der Trappisten* (Paderb. 1873).

Trasime'nus, Lacus. See PERUGIA, LAKE OF.

Trass, an unstratified tufaceous alluvium, probably of Pliocene age, found forming great deposits in the district of the Lower Eifel. It is probably of volcanic origin, and is compared by Sir C. Lyell to the 'Moya' of the Andes. For the most part it is composed of pumice, and contains also lumps of lava, pieces of half-burnt rock, and vegetable remains. It is used to a considerable extent as a hydraulic cement, like the Italian pozzuoli.

Travancore', a native state in India, occupying the S.W. corner of the peninsula, bounded N. by Cochin, and separated by the Ghauts from the Madras districts of Madura and Tinnevelly. Area, 6730 sq. miles: pop. (1875) 2,311,379. The mountains inland rise to the height of 6000 feet; they produce valuable timber, and on their slopes cardamoms and coffee are cultivated. Wild beasts are numerous, of which the most remarkable is the black species of panther. From the mountains, rivers dash on the narrow strip of plain, and terminate in back-waters and lagoons, among which rice is grown, and the cocoa nut and the areca nut abound. Another staple product is pepper, and nutmegs and cloves are also grown. T. enjoys the reputation of being the best-governed state in India. The administration was for many years in the hands of the late Dewan, Sir Madhava Rao. In ten years one million stg. was spent on public works, and there is no debt. Education and sanitary requirements are as well cared for as in a British province. The revenue is over £500,000, of which half comes from land, and £100,000 each from salt and tobacco. Of the expenditure, £100,000 is for public works; £81,000 British tribute; £57,000 temples; £56,000 administration; and £54,000 palace. Both Christians and Mohammedans sit on the judicial bench, as well as Hindus, for there is a considerable Mussulman and Christian native pop.—T. town, the former capital, is now deserted; the present seat of government is Trevandrum, where there is a first-rate college and hospital. The present dynasty, who are Kshattriyas, was established about A.D. 825. According to the ancient Malabar custom, descent is traced only in the female line. The British had a factory on this coast as early as 1684; and the first treaty dates from 1788, when the British bound themselves to protect T. against Tippoo Sultan, in consideration of a subsidy to be paid in cash or pepper. The present rajah, whose family name is Tirupadatu Swarupam, is a G.C.S.I. He is a highly educated man, understanding English perfectly, and being an excellent Sanskrit scholar. The 'First Prince' has similar intellectual tastes.

Trav'ellers, Laws Affecting. See under CARRIERS, *Carriers, Wharfingers, and Warehousemen, Laws Respecting.*

Trav'eller's Tree constitutes the monotypic genus *Ravenala* of the natural order *Musaceæ*—differing from *Musa* in habit, by having a tall, simple, woody trunk and distichous leaves. It bears the name of *R. Madagascariensis*, or is sometimes still called by its older title of *Uranea speciosa*. This noble and unique plant is a native of Madagascar, and is now subspontaneous in Mauritius. The leaves surmounting the palm-like trunk diverge on opposite sides from the summit, 'somewhat in the same way as the ribs of a fan from its centre,' each consisting of a footstalk 6 to 8 feet long, and an oblong, bright-green, shining, undivided blade of 4 to 6 feet. The flowers are crowded in the axils of large spathes along the terminal flower-stalks, and the seeds surrounded by a pulpy blue arillus are in a woody 3-celled capsule. In the cup-like base of the leaf-stalks a considerable quantity of water is contained, which can be tapped by piercing from below; and this supply, being availed of by thirsty travellers, has originated the name of T. T. The leaf-blades are used for thatching, the seeds are edible, and the blue aril furnishes an essential oil.

Tra'vemünde, a seaport of N. Germany, in the free territory of Lübeck, at the mouth of the Trave on the Baltic, 9 miles N.E. of Lübeck, of which it is an outport. It is a sea-bathing place, visited by about 1000 persons annually. Till the deepening of the Trave in 1852, T. was the sole port of Lübeck. Pop. (1875) 1719.

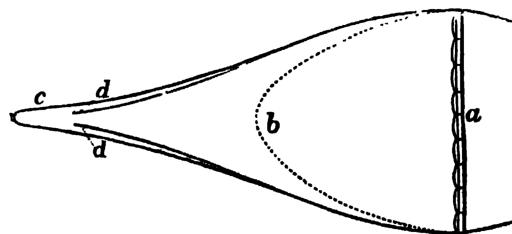
Tra'verse, a word of varying significance in military language. In fortification, traverses are portions of parapet formed of mounds of earth about 18 feet thick, thrown across ramparts to protect the guns and strengthen the defence. In gunnery, to T. is to direct a gun either to the right or left of its position, an operation accomplished by means of handspikes or wheel-screws. *Traversing platforms* are used for the efficient working of guns of 9 tons and upwards. The guns are mounted on truck-carriages or rollers in batteries. The gear of a platform of this kind is of two main portions, one for traversing, and the other for running the carriage in. It is worked by winch-handles, arranged so that the two portions may be detached when necessary. There are common, dwarf, and casemate traversing platforms.

Trav'ertin, the Italian name of a white calcareous stone, deposited from solution in the water of mineral springs, and occurring in great abundance in volcanic regions.

Trav'esty (Ital. *travestire*, 'to disguise'), a kind of burlesque in which the original characters are preserved, the situations parodied. Such are Comic Histories, Scarron's *Virgile Travesti* (1648), and Monbron's *Henriade Travestie* (1758).

Travnik', or **Traunik'**, a strongly fortified town of Bosnia, on the Lasva river, an affluent of the Bosna, in a swampy district at the foot of Vlaschiz-Planina, 45 miles W.N.W. of Serajevo. It has a citadel, a castle of the Middle Ages, 20 mosques, a Servian church, a synagogue, &c., and makes sword-blades. The Catholics dwell apart in Matosch or Solatz. Pop. 12,000. Near T. are the salt springs of Lepenicza. T. was the capital of Bosnia till 1850.

Traw'ling (a form of *trailing*), a mode of fishing which consists of dragging a kind of bag-net, called a trawl, along the



Beam Trawl.

bottom of the sea, and which is largely prosecuted during the winter season on the English, Irish, and Dutch coasts, and in the North Sea, our supplies of 'ground fish,' such as turbot,

plaice, brill, soles, skate, and other flat fishes, besides haddock, whiting, and kindred fishes of the cod family, being principally thus obtained. The trawl is a long triangular-shaped net, closed at the narrow extremity by a line and kept open at the wide end in various ways. The 'beam-trawl' (see fig.) is in most general use. It owes its name to the fact that a wooden beam (a), from 36 to 50 feet in length, is employed to keep the mouth of the net extended, the 'square' end of the 'back,' or upper side of the net, being fastened to it. The beam is fixed at its ends to iron frames, called 'trawl-heads' or 'head-irons,' which raise it 3 feet from the ground. The lower portion or 'belly' of the net has its edge (*b*) deeply curved in order that a considerable portion of the 'back' may have passed over the fishes resting in the mud before they are disturbed by the 'ground-rope' attached to the edge of the 'belly,' and so lessen their chance of escape. The narrow extremity of the net is called the 'cod' (*c*), and into it all the fishes pass and for the most part remain; some, however, particularly the soles, in seeking a way of escape, enter the 'pockets' (*dd*), which are formed by lacing together a portion of the 'back' and 'belly,' and get jammed therein. The 'cod' being, from the weight of the captured fish, subject to much wear, is covered on the under side with overlapping pieces of old nets. Smacks and luggers are the vessels usually employed in T. From the end of a 6-inch rope, or 'trawl-warp,' 150 fathoms long, depending over the stern of the vessel, two 'bridle-ropes' branch off, one to each 'head-iron,' where it is shackled; and by this gearing the trawl is towed for five or six hours in the same direction as the tide. When the tide has turned, the trawl is heaved up and emptied of its contents by undoing the 'cod-line.' On the S. and W. coasts of Ireland a 'pole' or 'hammer-trawl' is in use. The mouth of its bag has two long tapering wings of netting, which are weighted at the lower edge and corked at the upper. The extremity of each wing is fastened to a ⊥-shaped contrivance of iron called a 'hammer,' and the trawl is towed along by two ropes connecting the hammers with poles rigged out on each side of the trawling vessel. Smooth shallow water is essential to the good working of this trawl. The principal deep-sea T. stations in the United Kingdom are Plymouth, Brixham, Dover, Ramsgate. Lowestoft, Yarmouth, Grimsby, Hull, Scarborough, Fleetwood, Liverpool, Carnarvon, Tenby, Dublin, Waterford, Dingle, and Galway. On the W. coast of Scotland the sean or sweep-net, employed for catching herrings, is erroneously termed a 'herring-trawl.' Complaints of the destruction of spawn by beam-T., and the generally 'mangled' condition of the captured fish, were disposed of as groundless in the *Report* (issued in 1866) of the Royal Sea Fisheries Commissioners.

Traz-os Mon'tes ('beyond the mountains'), a province in the N.E. of Portugal, bounded N. and E. by Galicia and Leon (Spain), W. by Entre Douro e Minho, and S. by the Douro, which separates it from Beira. Area, 3999 sq. miles; pop. (1875) 374,837. Besides forming the southern frontier, the Douro follows great part of the W. boundary, and the province is watered by its affluents, the Sabor, Tua, and Tamega. T. is the loftiest part of Portugal; in the N. it is entered by the mountains of Leon (culminating in Serra de Monte Zinho, 9080 feet), and throughout has a wild, highland character. The district of Alto-Douro is noted for its port wine, while the uplands yield sumach and the valleys wheat, rye, hemp, flax, maize, oranges, almonds, &c. Silk is cultivated to some extent, and there are iron mines and mineral wells. The chief exports are mules, wool, silk, and wine. The capital is Bragança.

Trea'cle. See SUGAR.

Tread'mill, an invention for enforcing prison discipline, consists of a cylindrical wheel furnished with twenty-four equidistant radial steps. The prisoners, supported by a handrail before them, tread from step to step, imparting to the wheel a continuous rotatory motion, which may be usefully applied for grinding corn or turning other material. The T. was introduced into the prisons of Great Britain by Sir William Cubitt of Ipswich, and was first erected at Brixton gaol in 1817. The Chinese use a similar apparatus to raise water for irrigation.

Trea'son (Fr. *trahison*, Old Fr. *traïson* from *traïr*; Lat. *tradere*, 'to betray'). According to the common law of England, the nature of high T. is vague, and any act tending to lessen the dignity of the crown was formerly held to be within its scope. But an end was put to constructive T. by 25 Edw. III. c. 2, which defines the crime. Statutes of the reigns of Geo. III. and Geo. IV. confirm and expand the statute of Edward III. By these Acts the definitions of T. are as follows:—To intend any bodily harm to the king or his heirs—the intention being only capable of proof by an *overt* act, as by providing a weapon, or by sending a letter to incite another to join the enterprise; to have sexual intercourse with the queen-consort, or with the king's eldest daughter, unmarried; by *overt* act, to levy war against the king in his realm, or to try to force the repeal of a law by violence; by *overt* act, to adhere to the king's enemies within the realm, or to assist them; to counterfeit the great seal, privy seal, privy signet, or royal sign-manual; to slay a judge, under specified circumstances. By 1 Anne, c. 17, to endeavour to subvert the Act of Settlement (q. v.) is T. By 3 and 4 Vict. c. 52, to marry or be concerned in promoting the marriage of any child of her present Majesty, being under eighteen years of age, should the crown have descended to him or her, without the written consent of the regent and of both Houses of Parliament, is capital T.; and to assist any one having committed this crime to escape is a treasonable offence. The Act of 1870 abolishes forfeitures on account of T., but conviction of the crime disqualifies the criminal for certain civil and ecclesiastical offices.

Treas'urer, Lord High, the third great officer of the crown, was formerly a person of high rank, appointed by letters patent, in whom the custody of the royal treasury, the appointment of all officers employed in collecting the revenue of the crown, and the government of the upper court of the exchequer, were vested. A lord in virtue of his office, he sat among the barons. The first L. H. T. of England was Odo, Earl of Kent, who filled the office in the reign of the Conqueror. John de St. John was the first L. H. T. of Ireland (1217), and Sir Walter Ogilvie the first L. H. T. of Scotland (1420). The L. H. T. of England became L. H. T. of Great Britain on the Union between England and Scotland, and L. H. T. of the United Kingdom in 1816 when the revenues of Great Britain and Ireland were united. The Duke of Shrewsbury (in 1714) was the last person who executed the trust as an individual. Since the Hanoverian accession its functions have been entrusted to a commission, which now consists of five 'lords commissioners for executing the office of L. H. T.' See TREASURY.

Treas'urer of the Household is the second officer of the Lord Steward's department. The Treasurer of the Chamber was formerly an important officer and member of the Privy Council, who discharged the bills of the king's tradesmen. This office was abolished in 1782.

Treas'ure-Trove is treasure found *in* the earth, of which the owner is unknown. It belongs to the Crown, but the finder will be paid the intrinsic value. To appropriate T.-T. is an offence punishable by fine and imprisonment.

Treas'ury, The, one of the principal departments of the executive of the United Kingdom, having the entire control of the Treasury and disbursement of the public revenue. The Board of collection, whose offices are in Whitehall, consists of five lords-commissioners, viz., the First Lord of the T., the Chancellor of the Exchequer, and three junior lords. The First Lord of the T. is the official title of the head of the Administration, or the Prime Minister, and may be a member of either House of Parliament. His salary is £5000. He has an extended ecclesiastical, legal, and civil patronage, the appointment of all the principal officers of state, and the regulation of the various departments under the Crown. As chief of the executive his duties are so multiform that he exercises little practical control of the T., unless in the rare event of his holding in addition the office of Chancellor of the Exchequer. The Chancellor of the Exchequer is to all intents and purposes head of the T. He must be a member of the House of Commons, and has also a salary of £5000. The preparation of the budget devolves upon him, and he is the parliamentary mouthpiece of the Government in all matters relating to finance. In addition to the junior lords of the T. there are two joint-secretaries to the department, who are connected with the Administration and are members of the House of Commons, and also a permanent official secretary. One of the joint-secretaries to the T. is usually also the chief 'whipper-in' of the Government, who has the non-official but important duty of looking

after the interests of his party in the House of Commons, by securing the attendance of as many members as possible at important divisions. The T. has the appointment of all officers engaged in the collection of the public revenue; the army, navy, and civil service supplies are issued under the authority of the T.; and all exceptional cases and disputes in the matter of revenue are referred to its decision. The custody of the public revenue is vested in the Exchequer, and all sums withdrawn from the Exchequer must be vouched for by a Treasury warrant. Several important departments are subordinate to the T., such as the Boards of Customs and Inland Revenue, the Post-Office, the Woods and Forests, &c.

Trebb'ia (anc. usually *Trebia*), a river of N. Italy, rises in the Apennines near Genoa, and flows N. for 51 miles, falling into the Po near Piacenza. Here Hannibal defeated the Roman consul Sempronius in the spring of 217 B.C., when the river was swollen by melting snows. It was also the scene of a fierce struggle between the French under Macdonald and an Austro-Russian force under Suvarof on the 17th, 18th, 19th, and 20th of June 1799, in which the former were defeated.

Trebin'je, a town (formerly capital) of Herzegovina, on the Trebinschitza, 17 miles inland from Ragusa. It is the seat of a Catholic bishop, and has a garrisoned castle. Pop. 10,000 (or according to Roskiewicz, 3000). During the war of the Austro-Hungarian occupation, Suleiman Pasha was shut up at T. with 1500 men, and an equal number of Bosnian troops joined the insurgents here, 20th September 1878.

Treb'izond (Turk. *Tirabzon*; Gr. *Trapezus*, 'the table,' so called from the square shape of the town), the principal Turkish port on the Black Sea, on the N.E. coast of Asia Minor, and the second commercial city of the empire, 110 miles N.W. of Erzerum, with which the only communication is by badly-kept roads. It is finely situated on the steep slope of the Kolat Dagh (800 ft. high) facing the sea, and is partly surrounded by walls, and further defended by a Genoese citadel on an adjoining hill, and by forts at the mouth of the harbour. The gorge-like course of a mountain stream traverses T., and is crossed by several bridges. The coast is high and crested with pine-woods, and from the sea the irregularly-built town, with its minarets and gardens, has a striking appearance. There are 18 mosques, 15 Christian churches, and many elegant baths and spacious bazaars. The industries, chiefly weaving and dyeing, are unimportant; but the products of the surrounding country, which form part of the exports of T., comprise considerable quantities of boxwood (612,383 cwts. exported in 1875), loupes or walnut-tree knobs, valued in France for veneers, beans (12,626 cwts.), wheat and Indian corn (22,376 quarters), fruit and provisions (18,329 cwts.), nuts and walnuts (11,169 cwts.), skins (15,953 bales, value £63,812), wool (£17,900), tiftick and fillick (£72,480), tobacco (12,458 bales, £49,832). T. is an emporium for the Persian trade, but has suffered greatly from the opening of the railway from Tiflis to Poti (q. v.). It is a terminus for caravans from Erzerum, Armenia, Kurdistan, Tabriz, &., and has regular communication by steam-line with Constantinople, the Danube, and French ports. The harbour is only an open roadstead, and during the autumn equinoxes vessels have to shelter either at Batoum or at Platina, 6 miles W. In 1875 there entered and cleared the port 315 steamers (101 Turkish, 103 Russian, 53 French, 53 Austrian, 5 British) of 231,836 tons, and 5242 sailing-vessels of 31,620 tons. The total value of exports was £886,742, and of imports £1,426,011 (£838,298 from Britain). In 1877 the imports from Britain had fallen to £155,012 for local distribution, and £476,190 for transit to Persia. The exports from Persia amounted to £594,073, and the imports for Persia to £388,790. Besides the opening of the Poti Railway, the want of good roads in the interior, the neglect of the larger crown-forests, and the imposition of heavy custom dues, have checked T.'s prosperity. Mr. Biliotti, the English consul, says (1879) that if there were 'a carriageable road and means of transport between T. and the Persian frontier, many years would elapse before, if ever, Batoum attracted all the trade;' but should the Persian road be neglected, 'before many years elapse T. will have no more importance than Ooniah or Ordoo.' Pop. 50,000. T., founded by a colony from Sinope, 756 B.C., was a great trading town in Xenophon's time, and continued to flourish as an emporium for the Indian trade under the Roman empire. Its period of greatest prosperity as capital of the Comnenian empire of T. began in 1204 and lasted till 1461, when David, last of the Comnenes (q. v.), was captured by Mohammed II. Since then T. has belonged to the Porte. See Fallmerayer's *Geschichte des Kaiserthums von Trapezunt* (Mun. 1827), and *Fragmente aus dem Orient* (Stuttg. 2d ed. 1877).

Treb'le, the highest voice in women or boys, also called *Soprano* (q. v.). The treble or G clef, 𝄞 where G is placed on the second line of the stave, is the higher clef for keyed instruments and voices.

Tred'egar, a mining town of Monmouthshire, England, 12 miles W.S.W. of Abergavenny by rail, has grown up during the present century, and contains a town-hall, market-house, &c. The collieries and iron-works of the T. Iron Company employed 8131 hands in 1871, the total pop. of the town being 12,389.

Tree may be defined as a perennial plant with a woody trunk exceeding a man's height, and scarcely branching from the base. Excepting the palms and a few other endogens, all trees belong to the two great botanical divisions, exogens and gymnosperms, the latter including all cone-bearing trees and the former all other trees of the temperate regions of the world. The mode in which the branches come off from the trunk, and the angle at which the branchlets proceed therefrom, together with the comparative length of the upper and under branches, give rise to great differences in the contour of trees—a difference added to by the diversity of foliage. Although dense forests of immense area exist in temperate and cool zones of the N. hemisphere, the number of species is very limited compared with the luxuriant forests of the tropics. Thus Western Europe possesses scarcely 50 indigenous species of forest trees, while in the *Forest Flora* of British Burmah 2000 species have lately been described, and in most tropical countries the proportion of woody flora to the herbaceous is from 1½ to 3 of former to 1 of the latter. At the Philadelphia Exhibition upwards of 400 kinds of wood were shown as the native produce of the varied territory of the United States. The age of trees has a very wide range, from some of the palms which die at about forty years after once flowering, to the yew, baobab, sequoia, and others, which are supposed to attain 3000 years; and in like manner the height attained varies from 20–30 feet to 420 feet. The value of trees as regulating the climate and productive capacity of a country has already been adverted to. See ARBORICULTURE, TIMBER TREES, &c.

Tree'-Crab (*Birgus*), the name applied to certain crabs which are ranked among the 'land-crabs.' *B. latro* is a familiar species. It breaks open the shell of the cocoa-nut and of other fruits by repeated blows of its great claws. The T.-C. can live for long periods out of water, but deposits its eggs in the sea, to which it makes periodical journeys.

Tree Ferns are those species of *Filices* forming the giants of the fern race in which the stem (*caudex*) becomes arborescent. This is the case in the genus *Dicksonia* and in the tribe *Cyatheæ* (of Smith), in which the tree-like stems reach a height of 50 feet or even more, and are surmounted by a crown consisting of immense fronds sometimes measuring 20 feet in length. As the plants grow and the fronds fall, scars of an oblong-rhomboid form are often left arranged spirally around the stem, and such marks are also found on fossil fern-stems of the coal measures. The T. F. are widely distributed within or near the tropics, the southernmost limit being Tasmania, New Zealand, and Juan Fernandez. They occur at a considerable altitude in the Himalaya. A handsome species, named *Cyathea medullaris*, contains in its trunk a mucilaginous pulp comparable to sago, which is used extensively for food in Polynesia and New Zealand. The stems of *Alsophila excelsa* serve for building purposes, and 'last an incredibly long time.'

Tree-Frog (*Hyla*), a genus of frogs forming the type of a distinct family (*Hyladæ*), of the order *Anoura* (q. v.). It occurs on the continent of Europe, and also in the New World. The *H. arborea* is the common T. F., called *Rainette* in France. The body is of a bright green colour, and so nearly approaches the foliage of trees in hue, that the creature can be detected amid the foliage only with difficulty. The characteristics of the T. F. are found in the presence of suckers in the toes. In other

respects it resembles ordinary frogs. The *Hyla versicolor*, the common T. F. of America, is abundant in the N. of the United States. Another species (*H. viridis*) is found in the W. and S. The T. F. is exceptionally active, and pursues its insect-prey with avidity. The croak is loud but not unmusical, and on the approach of wet weather the animal becomes specially demonstrative.

Tree Kangaroo (*Dendrolagus*) is so named from its arboreal habits. It belongs to the kangaroo family (*Macropodidæ*), but differs from the true kangaroo in having its fore-legs nearly as long as the hinder members. The tail is not used to support the body as with the ordinary kangaroo, and the claws are very long and curved. The T. K. occurs in New Guinea.

Tref'oil (Lat. *trifolium*, 'three-leafed'), a frequent charge in heraldry, is usually represented *slipped*, or provided with a stalk. In architecture it is an ornament of three cusps in a circle.

Tref'oil, a name given more particularly to the clovers, but applied often by English farmers to *Medicago lupulina*. Birds'-foot T. is *lotus;* marsh T. the buck bean or *Menyanthes*. A number of other plants are also locally called T.

Treitsch'ke, Heinrich Gotthard von, an able German publicist and historical writer, born at Dresden, September 15, 1834, studied at Bonn, Leipzig, Tübingen, and Heidelberg, became *privat-docent* in history at Leipzig in 1858, and 1863 professor at Freiburg, resigned his chair in 1866 in consequence of the attitude of Baden in the German crisis, and went to Berlin, where he undertook the management of the *Preussischen Jahrbücher*, to which he had contributed since 1858. In the autumn of 1866 he was called as a professor to Kiel, and next year accepted a chair in Heidelberg, which he vacated for another at Berlin in 1874. Since 1871 he has been a member of the Reichstag. His chief works are: *Die Gesellschaftswissenschaft* (Leip. 1859); *Historische und Politische Aufsätze* (3 vols. 4th ed. Leip. 1871); *Zehn Jahre Deutscher Kämpfe*, 1865-74 (Berl. 1874); and *Der Socialismus und seine Gonner* (Berl. 1875).

Tremat'oda, an order of *Platyelmia* (q. v.) or Flat-bodied *Scolecida* (q. v.) allied to the *Tænada* or Tape Worms, and represented by the various kinds of Flukes (*Fasciola*). The characters of the T. are the flattened and leaf-like character of the body and the presence of one or more ventrally-placed suckers, the most anterior of which is perforated by the mouth. There is no anus or vent, but a branched digestive system is developed. No true perivisceral space or body-cavity occurs, and the sexes are as a rule united. There are no cilia on the integument of the adult. The T. undergo a further metamorphosis during development. T. in their native state inhabit the alimentary canal and its appendages as a rule; but they may occur under the skin—as in the case of the *Fasciola hepatica* or Common Liver Fluke, whose normal situation is the liver and bile-ducts of the sheep, in which animal it produces the disease known as 'Rot' (q. v.); this fluke also occurs in man's liver, or occasionally beneath the skin. The common fluke presents a good example of the group. The body is flattened and of oval shape. There are two suckers, the anterior perforated by the mouth, the lower or *acetabulum* being imperforate. The digestive system consists of a set of branched tree-like tubes ending cæcally, while the nervous system consists of two ganglia situated in the head and sending filaments backwards. The embryos pass through a metamorphosis, and find a first lodgment within the body of the fresh-water snail, where they become tailed organisms or *Cercariæ;* these, being swallowed by the sheep, pass to the liver, and there become the adult flukes. The genus *Distoma* or *Fasciola* includes the typical forms of T., and *D. lanceolatum* is another species in which the alimentary canal is not branched. Another genus of T. is *Bilharzia hæmatobia*, found in the blood-vessels of man in Egypt, S. Africa, Mauritius, and other regions. The male attains the length of ½ an inch, and the female 1 inch; the sexes being, contrary to the general rule amongst the T., distinct in this genus.

Tremell'a, a genus of *Fungi*, the type of the order *Tremellini*, distinguished by a tremulous gelatinous texture. The species vary much in form and in colour. They generally occur on the dead branches of trees and shrubs.

Trem'olite (from *Val Tremola*, in Switzerland), a variety of the mineral hornblende, of a grey or greenish colour, and usually occurring in long, prismatic, translucent crystals. The specific gravity of T. is 2·93, and it fuses with difficulty before the blow-pipe into a colourless glass. It occurs in dolomite, crystalline limestone, and other of the older rocks.

Trem'olo, Tremolan'do, in music, trembling caused by the rapid repetition or alternation of notes. Also a vibration of the voice in singing suitable for the production of certain effects, but often too much and too indiscriminately used by vocalists.

Trenail (Old Eng. 'wooden nail'), a long wooden peg about 1 to 1¾ inch in diameter, used in shipbuilding for securing planking to the timber, &c. Trenails are commonly made of teak or oak.

Trench. See SIEGE.

Trench, Richard Chevenix, born at Dublin 9th September 1807, from Harrow proceeded to Trinity College, Cambridge, where he graduated B.A. (1829). Taking orders, he became curate at Hadleigh (1833-35), incumbent of Curdridge (1835-40), curate to Archdeacon Wilberforce at Alverstoke (1840-44), and rector of Itchenstoke (1844-45); then, having held the Hulsean lectureship (1845-46), the chair of philosophy at King's College, London (1846-58), and the deanery of Westminster (1856-63), he was consecrated Archbishop of Dublin, 1st January 1864. Between 1835 and 1846 T. published six volumes of Wordsworthian poetry, reissued in *Poems, collected and arranged anew* (1865); but it is as a writer on philological and theological subjects that he is most widely popular. His numerous works include *Notes on the Parables* (1841; 13th ed. 1847), *Notes on the Miracles* (1846; 10th ed. 1874), *On the Study of Words* (1851; 16th ed. 1876), *Proverbs and their Lessons* (1853; 6th ed. 1869), *Synonyms of the New Testament* (1854; 8th ed. 1876), *English Past and Present* (1855; 10th ed. 1877), *Studies in the Gospels* (1867), *Plutarch, his Life, his Lives, and his Morals* (1874), and *Lectures on Mediæval Church History* (1878).

Trenck, Franz, Freiherr von der, was born January 1, 1711, at Reggio, in Calabria, where his father was an Austrian general. At the age of seventeen his excesses obliged him to fly from Austria, and accordingly he entered the Russian service, but was in a short time for his insubordination cashiered and sentenced to six months' hard labour at Kiev. He next returned to his estates in Croatia, and raised a force of 1000 Pandours, which he placed at the service of Maria Theresa in 1740. He was distinguished during the War of Succession by his reckless courage, but the atrocious cruelty and rapine of his followers have made his name a byword in modern warfare. In 1745 he was found guilty by a court-martial of having communications with the enemy, and sentenced to imprisonment for life at Brunn, where he died, October 14, 1749. See his untrustworthy Autobiography (Leip. 1748; 2 vols. Vienna 1807); and Hübner, *Franz von der T.* (3 vols. Stuttg. 1788-89).—**Friedrich, Freiherr von der T.**, cousin of the preceding, was born at Konigsberg, February 16, 1726. At the age of fourteen he entered the Prussian army, and at eighteen was a favourite aide-de-camp of Friedrich the Great. In June 1745, on account of a detected correspondence with his cousin, the Pandour captain, and his extravagant passion for the Princess Amalie, he was suddenly flung into prison at Glatz. On the 24th December 1746 he succeeded, after many vain attempts, in escaping, on which he fled first to Vienna and afterwards to Russia. In 1748 he entered Prussia in order to visit his family, but was arrested at Danzig and committed to a rigorous confinement at Magdeburg. He was liberated in December 1763, and had his property restored in 1787. He commenced business at Aix-la-Chapelle as a wine merchant, but being unsuccessful, in 1790 went to Paris, where he attached himself to the Jacobin party. He was guillotined as a Prussian spy, July 25, 1794. His Autobiography, *Merkwürdige Lebensgeschichte* (4 vols. Berl. 1786; Fr. trans. 1789) for a time made this 'loud, blustering, extensively fabulous blockhead,' the hero of the fickle Parisians, and in our own times his life has been made the subject of a historical romance (3 vols. Celle 1860). See Poiteau, *Aventures du Baron du T.* (Par. 1853).

Trent, a river of England, which rises in the hills of N. Staffordshire, in a pond near Kinpersley, 10 miles N. of Burslem. It flows S.E. through Staffordshire till it receives the Tame, when it turns N.E., and enters the Humber near the mouth of the Ouse. Its chief tributaries are the Sow, Blythe, Dove, and

Derwent, on the left; and the Tame, Soar, Devon, and Idle on the right. Its length is 148 miles. It is navigable up to Burton for barges, and is subject to a bore or 'eagre.' The basin of the T. and Humber is the largest in England, its area being 9100 sq. miles.

Trent (Ger. *Trient*, Ital. *Trento*, Lat. *Tridentum*), an old town of Austria in the Tyrol, on the left bank of the Adige, 51½ miles N.N.E. of Verona by rail. It has two suburbs, San Martino and Santa Croce, and in its environs villages rise beautifully above one another on the mountain slopes. Of the town, which is quite Italian in its character, the finest squares are the Piazza d'Armi and the Piazza del Duomo, the latter adorned with a fountain, and containing the courts of justice. Among the 15 churches the finest are the Cathedral, a Romanesque basilica, with two domes, founded in 1048, begun in its present form in 1212, and completed in the 15th c.; Santa Maria Maggiore, where the celebrated Council of T. (q. v.) sat from 1545-63, containing an admirable organ, and adorned with portraits of the members of the council; and the Church dell' Annunziata, with a high cupola resting on four pillars. Other buildings are the town-hall, the Palace of Justice, the theatre, and the Palazzo Buon Consiglio, formerly the residence of the prince-bishops, now a barrack. The town has two monasteries, a theological institute, an upper gymnasium, and a public library and museum. The industries are silk-spinning and weaving, dyeing, iron-founding, and the manufacture of cloth, pottery, and cards. In the vicinity are great marble quarries. Pop. (1869) 17,073. T. was a Roman *colonia*, became in the 4th c. the seat of a bishop, and in 574 of a Lombard duke. In 1027 Konrad II. granted to its bishops princely rank and the fief of the town. The bishopric was secularised in 1803, and added to the Austrian crown-lands. See Barbacovi, *Memoire Storiche della Città e del Territorio di T.* (Trent 1808); Lupi, *Topografia della Città di T.* (Trent, 2 vols. 1831); Perini, *T. e suoi Contorni* (Trent 1859).

Trent, Council of (*Concilium Tridentinum*), the eighteenth in order and the first in importance of the 'Œcumenical' councils recognised by the Roman Catholic Church, was called forth by the Reformation in the 16th c., and demanded by both parties in the contest, for the reform of church discipline and the settlement of the points of controversy. After being repeatedly postponed by the intrigues of the Papal court and the rivalries of Karl V. and François I., it was convened at Trent as an exclusively Roman council by Pope Paul III., December 13, 1545. In March 1547 it was transferred to Bologna, but was reopened at Trent, by Pope Julius III., May 1, 1551. It was broken up, January 18, 1562, in consequence of the victorious advance of the Elector Moritz, but was recalled by Pope Pius IV., January 18, 1562, and reached its close, at its twenty-fifth session, December 4, 1563. Its decrees and canons, which were confirmed by a bull of Pius IV., January 26, 1564, are drawn up with much clearness and precision, though the doctrines of the Protestants are often exaggerated or falsified. They were immediately acknowledged in Spain, Portugal, Italy, Poland, and Catholic Germany, and, in their doctrinal part, in France. The principal articles of faith decreed, with anathemas, were the canon of Scripture, with the Church as sole interpreter, progressive justification, the seven sacraments, transubstantiation, purgatory, the invocation, veneration, celibacy of the clergy, and auricular confession. The *Decreta* and *Canones* were first published by Paul Manutius (Rome 1564), and have been frequently edited; the best edition is that by Schulte and Richter (Leip. 1853), the latest that by Pess (Regensb. 1877). The history of the Council of T. has been written by the liberal Sarpi (q. v.) and the Ultramontane Pallavicino (q. v.). See Theiner, *Acta genuina Œcumenici Concilii Tridentini* (2 vols. Leip. 1874); Calenzio, *Documenti inediti e nuovi lavori letterarii sui Concilio di Trento* (Rome 1874); Maynier, *Étude Historique sur le Concile de Trente* (Par. 1874); and Dollinger, *Ungedruckte Berichte und Tagebücher zur Geschichte des Koncils von Trient* (vol. i. Nordling. 1876).

Trenton, capital of the State of New Jersey, U.S., 56 miles S.W. of New York, and 27 N.E. of Philadelphia by rail. It stands on the Delaware, which is here crossed by two fine bridges. T. is well built on elevated ground, and contains a State-capitol, 29 churches, including 8 Methodist Episcopal and 6 Presbyterian, 5 banks, a public library, 4 daily, and 5 weekly newspapers. It has the largest crockery factories in America, and an extensive manufacture of iron in all its branches, employing 2000 men, and producing £1,500,000 worth of goods annually. Its wool and brick industries are also large. Pop. (1876) 22,874. T. was taken by Washington in a night attack, 25th December 1776.

Trepan'. See TREPHINE.

Trepang'. See HOLOTHURIA and BÊCHE DE MER.

Trephine' and Trephining (from Gr. *trupaō*, 'I bore'). The 'trephine' or 'trepan' is a small cylindrical or circular saw, with a centre pinon which it works, and is used by surgeons for the removal of portions of bone. 'Trephining' is practised on the skull in cases of fracture; (1) when a portion of the bone is depressed and encroaches on the cavity of the skull, producing compression of the brain, and the fragment cannot otherwise be raised; (2) for punctured fractures by which the inner table is splintered, separated from the outer table, and lying loose on the dura mater; and (3) for effusion of blood, or of inflammatory products, between the bones and membranes, or between the latter and the brain, when the effused fluid may be evacuated by the opening.

Tres'pass is generally any act of one individual by which another is injured in person or property; but in the limited and common acceptance, it signifies an entry by one individual into the ground of another contrary to the owner's will; every man's ground being in the eye of the law either enclosed by a fence or imaginary line. The owner of cattle is answerable for damage done by their T. To enter on land to execute a legal mission, or to pay money or ask payment of it, if there payable or due, is not T.; but see HOUSE. A shopkeeper is not bound to admit any one into his shop, nor to deal with him, but an innkeeper must, if possible, give accommodation and food to those asking for these (see INNKEEPER, LAW AFFECTING THE). If, however, any one misconducts himself in an inn or tavern he becomes a trespasser from the moment of entry. An exclusive interest in the crop or herbage is sufficient to maintain an action for T.; but actual or constructive possession must be proved. If trees are excepted in a lease, the land on which they grow is also excepted; consequently the landlord may maintain an action of T. for breaking his close. It is a common error to suppose that a trespasser can be given into custody and criminally prosecuted; the only recourse which an owner or tenant of lands has against a trespasser being by an action for damage, or in Scotland by Interdict (q. v.). The requisite physical force may be used to expel a trespasser.

T. in Sporting.—The common law of England allows one man to hunt foxes and some other animals over the ground of another, if no material damage is done; but the right must be carefully made use of, and with good temper, for a jury will consider not only the actual damage sustained by a plaintiff, but also any insult which he has been subjected to: thus, in the case of Merest *v.* Harvey, where the defendant ignored the warning of the plaintiff that he was trespassing, and grossly insulted the plaintiff, the jury awarded the latter £500, though he had sustained no pecuniary loss by the trespass. Every T. is *wilful* where the defendant is warned not to come on the land. And every T. is *malicious* when the intent of the defendant is plainly to annoy the plaintiff. In such cases the judge is bound by statute to award *full costs* to the plaintiff. See POACHING.

Tress'ure, in heraldry, a diminutive of the Orle (q. v.), and half its breadth. It is usually borne double, decorated with fleurs-de-lis (the alternate ones reversed), and blazoned either a 'double T. fleury,' or 'fleury counter-fleury.'

Trevel'yan Experiment, so named from the person who first carefully studied the phenomenon, beautifully illustrates the transformation of heat into sound. When a shovel-shaped block of iron or copper, after being heated to a considerably high temperature, is poised delicately upon a cold lead support so as to press nearly equally on two points separated by a groove, a sound more or less musical is frequently heard. The explanation, as given by Faraday, is that the heated 'rocker' rarely comes in contact with the two points of support simultaneously. Hence the one which is first touched is first heated, and the metal at that point expanding tilts the rocker over upon the other point. Here the action is repeated, and the rocker is tilted back again upon the first point, the metal near which has had time to con-

tract, and is in readiness to repeat the process. The successive impacts accompanying this rapid tilting action combine to form a musical note, which may be varied in pitch and intensity by loading the rocker, or in any way altering its moment of inertia.

Trevel'yan, Sir Charles Edward, Bart., K.C.B., a son of the late Archdeacon T. of Taunton, was born in 1807, educated at the Charterhouse and Haileybury College, and entering the East India Company's Civil Service, held important posts under Lords Auckland and Bentinck. His vigorous action promoted the abolition of Indian transit and town dues, and the introduction of educational institutions on a European model. In 1840 he was appointed Assistant-Secretary to the Treasury, and in 1848 was made K.C.B. for his attempts to relieve the distress caused by the Irish famine. With Sir Stafford Northcote and others he was long engaged in the revision of the civil establishments which led to the Civil Service being thrown open to public competition. He was Governor of Madras from 1859 to 1860, when he was recalled for protesting against the new taxes then imposed by the Government of India, although the Imperial Government accorded him a highly eulogistic vote of thanks. In 1862 he became Financial Minister in India, a post in which he inaugurated important fiscal reform and a vast extension of public works, and which he resigned on account of ill-health in 1865. On his return he published two able pamphlets on army reform, a subject on which he had given evidence before the Royal Commission of 1857. Having subsequently devoted his attention to metropolitan charities, he was created a baronet in 1874. T. married Miss Hannah More Macaulay in 1834, and is the author of *Education of the Irish People* (1838), *The Irish Crisis* (1848), *Purchase System in the British Army* (2d ed. 1867), *The British Army in 1868* (1868), &c. He died 23d March 1879.—**George Otto T.**, son of the preceding, was born at Rothly Temple, Leicestershire, 20th July 1838, and passing from Harrow to Trinity College, Cambridge, graduated as second classic. He entered the East India service by competition, but soon returned from India and was elected Liberal representative of Tynemouth in 1865, and of the Scottish Border Burghs in 1868. In the second Gladstone administration he was appointed Civil Lord of the Admiralty (December 1868), but resigned office in July 1870, being opposed to the Educational Bill of the ministry. He strongly advocated, in and out of Parliament, a sweeping army reform, including the abolition of purchase, effected in 1871. The Volunteer movement had his active support, and he opposed the Regimental Exchanges Bill of 1875. With impetuous rhetoric and fiery invective he has severely criticised the Conservative foreign policy, declaring that war with Russia was only avoided by the resignation of 'the two brave peers' (Carnarvon and Derby), and that, apart from the question of justice, the Afghan War was opposed to the interests of our Indian Empire. On February 22, 1878, he moved the resolution on the extension of the County Franchise, which was lost by fifty-two votes. T.'s literary works comprise *Letters from a Competition Wallah* (new ed. 1866), *Cawnpore* (1865), *Ladies in Parliament and other Poems* (1869), and *Life and Letters of Lord Macaulay* (2 vols. 1876; 2d ed. 1877).

Treves. See TRIER.

Trevi'sa, John, born in Cornwall about the middle of the 14th c., was educated at Queen's College, Oxford, where he was a friend of Wiclif's, became vicar of Berkeley in Gloucestershire, and canon of the collegiate church of Westbury. He is said to have died in 1412. T. spent most of his leisure in turning Latin books into English. His chief works are a translation of Higden's *Polychronicon* (1387), one of the earliest specimens of English prose, of Occam's *Dialogue between a Soldier and a Clerk*, and of *Bartholomæus de Proprietatibus Rerum*, which last, a very mine of rare English words, stands in the list of proposed reprints of the Early English Text Society. Caxton said that T. had also translated the Bible; but his version, if it ever existed, is not known to be extant.

Trevi'so, a town of N. Italy, capital of the province of the same name, on the Sile, 18 miles N. of Venice by rail. The still unfinished Duomo of St. Pietro, with its five towers, dates from the 12th c., and contains paintings by Titian, Pordenone, &c. The Gothic church of St. Niccolo, the theatre, the prison, the courts of justice, and the town-hall, are the chief buildings of interest. There is a library of 30,000 volumes. Silk manufactures are carried on. Pop. (1876) 28,496. T., the ancient *Tarvisium*, did not come into notice till the fall of the Western Empire, since which time it has always been important. Revolutionary movements against Austrian dominion broke out here in 1848.

Trev'or, Sir John, (1) a Secretary of State in the reign of Charles II., and son-in-law of John Hampden, was the eldest son of Sir John T., of Trevallin, in Denbighshire, and was born in 1626. Both father and son were 'halters in the Rebellion, and adherers to the usurper.' The father sat in the Long Parliament, but favoured the Restoration, while the son became a gentleman of the bedchamber to Charles II., and was despatched in 1668 as special envoy to France. On his return he was knighted, and in September appointed to be a Secretary of State, an office which he held until his death. In consequence of his opposing the French policy recommended by the Duke of York, he lost his influence, was ousted from the cabinet in 1670, and found himself 'merely in the skirts of business.' He died one year before his father, May 28, 1672.—(2). Speaker of the House of Commons under James II. and William and Mary, was born in 1633. His family was connected with that of the preceding, and he himself was, by his mother, cousin to the infamous Jeffreys. His rise was rapid through the influence of his powerful relative, and he was knighted, 1671, became king's counsel, 1678, member of the House of Commons, 1679; Speaker, May 1685; Master of the Rolls, October 20, 1685, and a member of privy council, July 6, 1688. After the Revolution, he obtained the favour of William III., and was engaged by him to bring over by bribes the more obstinate members of the House of Commons, of which he was again elected Speaker, March 20, 1690. For some years he held this position, until, in March 1695, the corrupter of others was discovered to have been himself corrupted; and having been found guilty of receiving bribes by a Parliamentary committee, he had the mortification as Speaker of putting to the House the question of his own shame, and, in declaring the issue of the vote, of publishing his own guilt. He never returned to the House, and was, a few days later, formally expelled. He retained the position of Master of the Rolls for the remaining twenty-two years of his life, 'to the great encouragement of prudent bribery for ever after.' He died May 20, 1717.

Trian'gle, in geometry, is a figure bounded by three sides, and therefore possessing three angles. A *rectilineal* T. is a plane figure contained by three straight lines, according to the relations of the length of which the T. is distinguished as equilateral, isosceles, and scalene. The equilateral T. has all its sides equal, the isosceles two of its sides equal, and the scalene all its sides unequal. The sum of the three angles is equal to two right angles; hence two of the angles at least must be acute, *e.g.*, each less than one right angle. When one of the angles is obtuse, the T. is called an obtuse-angled T. The sum of any two of the sides is always greater than the third, and of three given lines which satisfy this condition only one definite T. can be formed, so that two triangles which have their sides equal each to each must be equal to each other in every respect. The area of a T. is equal to the product of the length of any side into the length of the perpendicular upon it from the opposite angle; hence triangles upon the same base and between the same parallels, being thus of the same height, are equal in area. If one or more sides are curved, the T. is curvilineal. Such, for instance, is the sector of a circle, bounded by two radii and the intercepted arc. The most important of all curvilineal triangles is the *spherical T.*, which is formed by the mutual intersection of three great circles upon the surface of a sphere. The angles are measured by the inclinations of the tangents to the corresponding great circles at the angular points, and their sum is greater than two right angles by a quantity known as the *spherical excess.* This excess, multiplied by the square of the radius of the sphere, gives the area of the T. When the radius of the sphere is infinite, the spherical excess vanishes, and the T. becomes a plane rectilineal T.

Trian'gle of Forces, the name given to the proposition in statics, which asserts that, if three forces meeting at a point are equal and parallel to three sides of a triangle, their effects balance, and equilibrium is maintained. The *polygon of forces*

is the name of a more general proposition of precisely the same nature.

Trian'gular Numbers. See FIGURATE NUMBERS.

Triangula'tion is the method by which a large tract of the earth's surface is surveyed, and consists in choosing positions which may be easily observed from a number of other surrounding positions. The distance between two of these is carefully measured, and then by careful measurement of angles the necessary elements of the network of triangles formed by joining contiguous pairs of the chosen points are supplied. The area of the district is thus estimated; or the results may be used to measure the length of an arc of meridian with a view to determining the dimensions of the earth. The triangles are sufficiently small to be considered *individually* plane triangles; but when they are combined, correction must be applied for their sphericity. See SURVEYING.

Tri'as, in geology, is the series of rocks which lie above the Permian and below the Jurassic formations, thus forming the lowest or oldest subdivision of the Secondary or Mesozoic group. It originally received its name from the German geologists, owing to its readily admitting, as developed in that country, of a separation into 3 well-marked groups, as follows:—

Germany.	*England.*
Keuper.	Saliferous marls and sandstones.
Muschelkalk.	Wanting.
Bunter Sandstein.	Reddish sandstones and conglomerates.

Of these three German formations the first attains in certain localities a thickness of about 1000 feet, and its most remarkable members are the St. Cassian or Halstadt beds, which occur on the flanks of the Austrian Alps. They contain evidences of a rich marine fauna, which helps in many ways to bridge over the gulf between the Palæozoic and Secondary series. The Muschelkalk or 'shelly limestone' is wanting in England, and contains, among other marine fossils, an immense profusion of the *Encrinus liliiformis* or 'Lily Encrinite.' The Bunter Sandstein or 'variegated sandstone' is well seen in the Vosges, and also in the Hartz mountains, and is noteworthy for its numerous remains of fossil plants. Many reptilian remains have been obtained from Triassic rocks, and the oldest known mammal, viz., *Microlestes*, is also from the Upper T. Among the British representatives of this formation are the rock-salt beds of Cheshire, &c.; and the sandstones of Connecticut, with their footprints of birds and mammals, are also referred to the T.

Tribe'ni, 'the confluence of three rivers.' Such a spot is peculiarly sacred in Hindu mythology. The most frequented places of pilgrimage which bear this name are (1) in the district of Hoogly, Bengal, at the junction of the Hoogly river with the Jamuna and the silted-up bed of the Saraswuttee; (2) the town of Allahabad, where the Ganges and Jumna meet, and the third stream is imaginary; (3) where the Gunduck river and two of its affluents debouch from the mountains of Nepal on to the plains in the British district of Chumparun.

Tribonia'nus, a Roman jurist of whom little more is known than that under Justinian (q. v.) he held the posts of quæstor, consul, and master of the offices, and from 528 to 533 A.D. took a principal part in the compilation of the Code (q. v.) bearing that emperor's name. Temporary disgrace (531), arising out of the revolt of Nicæa, was followed by T.'s restoration to his former honours, which he retained down to his death in 545.

Trib'unes, originally representatives of tribes—*e.g.*, of the Ramnes, Tities, and Luceres, in the later days of the Roman republic—were officers invested with a variety of functions. The plebeian T. (*tribuni plebis*) were first created after the secession of the plebeians to the Mons Sacer (494 B.C.), could not be chosen from the patrician order, and varied in number from two to ten, any one of whom might impose a veto on his fellows' actions. Set up as an opposition magistracy to the consuls, as an embodiment of plebeian rights, the T., whose persons were inviolate, extended their powers little by little, till ultimately they surpassed all other officers of state, and on the negatory *potestas tribunicia* the imperial dignity itself was chiefly based. Consular T. were three magistrates appointed in 444 B.C., a number afterwards raised to eight, who might be either plebeians or patricians, and who till 367 B.C. occasionally supplied the place of Consuls (q. v.); and legionary T. were six officers of a Legio (q. v.) who took the command by turns.

Trichi'asis (Gr. *thrix*, 'a hair') is an inversion of the eyelashes. Usually three or four of the hairs are turned towards the eyeball, and excite a pricking sensation, creating great irritation. There is a constant watery state of the eye, and a disposition to rub it, the irritation setting up an inflammatory state. The cure consists in removing, one after the other, all the inverted and misplaced cilia by means of forceps without teeth, the surface being merely roughened. When a considerable number of the cilia are inverted, extirpation of a fold of skin may be necessary, or extirpation of a strip of the integuments, including the bulbs of the cilia. When several cilia in a group are inverted, a triangular or narrow wedge-shaped piece of the whole thickness of the lid, including the eyelashes, may be removed and the edges brought together with sutures.

Trich'ina (from Gr. *trichinos*, 'pertaining to hair'), the name given to a small Nematoid worm. In an asexual state it occurs in the muscles of warm-blooded Vertebrate animals, in whose digestive system it attains sexual maturity. As in other Nematoids, the sexes in T. are distinct. The average length of the female is from $\frac{1}{12}$th to $\frac{1}{8}$th of an inch. The male is much smaller than the female. In its sexually immature condition, the T. exist within little sacs or capsules, within the muscular tissues of their hosts. It was in this condition that the T. was first discovered in the dissecting-room of St. Bartholomew's Hospital, London, in 1835; Mr. Wormald, the then demonstrator of anatomy, sending the specimen to Owen, who named the organism. Sir James Paget investigated the subject independently about the same date. It was not, however, until 1855-60 that the true history of the T. was determined. Virchow and Leuckart then showed that the T. was not, as had been supposed, the immature form of some other Nematoid. By feeding animals on trichiniased flesh they developed young T. in large numbers, and traced their history, about to be described. As the T. lie coiled up within their cysts in the muscles, each measures about $\frac{1}{75}$th inch in diameter, and about $\frac{1}{78}$th inch in length. These cysts are liable to undergo calcareous degeneration after a time, this process resulting in the destruction of the contained worm. The number of T. which may find lodgment in the muscles is sometimes enormous. Leuckart calculated that a single ounce of cat's muscle contained no less than 325,000 of these parasites, whilst in a human host so affected over 20,000,000 might be contained. The *development* of the T. is a subject which, from its bearings on human health, naturally attracts much attention. When a portion of T.-infested flesh—say of the pig—is eaten by man, the cysts are dissolved, and the T. are liberated within the stomach of the human subject. In a short period these immature T. become sexually perfect. They develop generative organs, and produce young *viviparously* in large numbers. The young next begin to seek a lodgment for themselves in the muscles, and in that search bore their way through from the alimentary system to the muscles. During this latter process the infested subject experiences severe pains, the nature of these pains being unsuspected when the first cases of *Trichiniasis* were observed. The pains were supposed to be due to acute rheumatism, while the suddenness of the attack was even suggestive of poisoning. Once situated in the muscles, the young T. develop capsules or cysts around their bodies, and present the appearance assumed by their progenitors in the muscles of the pig. This young brood of T. can of course undergo no further development unless the muscles of man be eaten by some other warm-blooded quadruped, in which case the cycle of development just described would be again passed through. Davaine's experiments seem to prove that adult T. soon perish in cold water, and do not long appear to survive the death of their host. They may, however, remain tolerably active in the larval condition in putrid meat or in flesh that lies decomposing in water, and thus infection may be conveyed to pigs or to other animals which drink the infested fluid.

Trichin'iasis is a disease produced by the presence of trichinæ within the human system, and within the bodies of other animals liable to infestation. The first well-marked case occurred at Dresden in 1860, the patient being a servant-girl, who

was admitted to hospital, having taken ill on January 12. The patient died after a short illness characterised by symptoms of lung-inflammation, rheumatic pains, spasmodic contraction of the limbs, and other abnormal conditions, indicating some obscure lesion the nature of which was imperfectly understood. It was discovered at the *post-mortem* examination, that in the muscles of this patient numerous larval trichinæ were encysted, whilst mature trichinæ were found in the intestines. Previously to her illness the patient had assisted in making pork sausages, and had eaten some of the meat in a raw state, this fact accounting for the trichinose infestation. Zenker, who records the case, recognised in the symptoms those of a new lesion caused by the presence and development of trichinæ within the tissues of man. The preliminary symptoms are loss of appetite, prostration, and general debility, which continue for about a week. Pains of a rheumatic character, œdema, or dropsy and swelling of the limbs, along with fever, next occur, indicating the progress of the trichinæ brood from the digestive system to the muscles. This stage of T. is unquestionably the most dangerous. It is during the migration of the trichinæ from the alimentary canal, and as they force their way through to the muscular system, that the patient experiences the most severe symptoms and stands in greatest danger. Severe pains are experienced at this period in a typical case of T., and even breathing may be executed with difficulty owing to the lesions of the muscles. Diarrhœa is also prevalent, the symptoms on the whole bearing a resemblance to those of gastric fever. In about four weeks after the commencement of the symptoms, the disease begins to abate. In severe cases the diarrhœa may continue, and often aids a fatal issue, arising from the prostration, together with the total derangement of the secretions. In an acute case of T., death has been known to occur as early as the fifth day of the disease, while a fatal issue has been allayed as late as the forty-second day. Epidemics of T. have chiefly occurred on the Continent, where the habit of eating smoked and uncooked sausages is widespread. At Hattstadt, in Oct. 1863, an epidemic of this disorder affected 158 persons, a fatal result occurring in 28 cases. An examination of pig's flesh shows that trichinæ are frequently found in the muscles. No external signs in the pig afford evidence of the presence of trichinæ, and the microscopic examination of the flesh is the only true test of infestation. A temperature of 167° F. is sufficient to kill trichinæ larvæ, and the prohibition against uncooked or imperfectly cooked animal food of all kinds, is to be rigorously insisted upon in the rules of hygiene. The *treatment* of T. appears to consist in active purgation in the early stages of the disease, with the view of removing the worms from the intestine, calomel being the purgative usually given. German statistics fortunately show a decline in the number of cases of T.—from one out of every 2000 pigs in 1876 to one in every 2800 in 1877. The absolute number of trichinose pigs in the latter year was 701 out of 2,057,273; and 138 persons were known to have suffered from T. On the other hand, from the *Lancet* of 22d February 1879 we learn that German investigators have made the disagreeable discovery that the bacon and pork imported into Europe from the United States is, contrary to the belief hitherto entertained, not at all free from the presence of the muscle-worm. There can be no doubt that increased caution in the use of pig's flesh is necessary on the part of the community.

Trichinop'oly (*Trichinapalli*), the chief town of the district of the same name, Madras Presidency, British India, on the right bank of the Cauvery river, 320 miles S.S.W. of Madras by rail. T. is celebrated for its fort, which was built (*circa* 1570) by a native prince of Madura, and formed the object of all the wars between the English and the French in S. India between 1749 and 1763, when Clive first rose to fame. The fort occupies a granite cliff rising 500 feet above the plain, crowned with a small pagoda, with a cave temple hewn out of its S. face. The walls have recently been levelled, and the moat filled up, and the whole is now being laid out as a boulevard. T. is the headquarters of the Brigadier commanding the S. Division of the Madras army. There are barracks for European troops and artillery. In the church is the tomb of Bishop Heber, who died here in 1826. The manufactures include jewellery, paintings on talc, paper and pith ornaments. The silver filigree work and the cigars are especially famous. Pop. (1871) 76,530.—The *district* of T., which lies on both banks of the Cauvery, landward of Tanjore, has an area of 3515 sq. miles; pop. (1871) 1,200,408. It abounds with gneiss, granite, iron-ore, and limestone. The products are rice, cotton, sugar, oil-seeds, and tobacco. The exports include saltpetre, hewn stone for building, and grindstones. The imports are English piece-goods. Besides the manufactures of the town, basket-boats are made of wicker-work covered with hides. This tract contains several *anicuts* or weirs, constructed across the river Cauvery, some by ancient Hindu kings, and others by Sir Arthur Cotton (1836-45). These irrigate 600,000 acres, and are considered the most successful works of their kind in India.

Trichoceph'alus (Gr. *trix*, 'a hair,' and *kephalē*, the 'head'), a genus of nematoid worms, inhabiting the *cæcum* or first portion of the large intestine of man. This parasite is rare in England, but is said to be common in France. The average length is from 1½ to 2 inches. The front part of the body is exceedingly slender. The species inhabiting man is the *T. dispar*. The development of the T. is very imperfectly known.

Trichop'tera. See CADDICE.

Trick'ing, in heraldry, is the representing by writing of the tinctures of a coat of arms sketched in outline with pen and ink.

Triclin'ium (Lat., from Gr. *triklinos*, from *tri*, 'three,' and *klinein*, 'to lie down'), among the later Romans the dining-room where guests were received, containing a square table surrounded on three sides by as many low couches for reclining, while the fourth side was left open to the access of attendants.

Tric'olour, the national flag of France, which, composed of blue, white, and red vertical strips, was taken as the badge of the National Guard at the commencement of the Revolution. Germany, Italy, Belgium, Holland, &c., have also since adopted tricolours.

Tridac'na, a genus of *Lamellibranchiate* mollusca, including the forms familiarly named 'Clams.' The *T. gigas* or Giant Clam is the best-known member of this genus, which forms also the type of a family (*Tridacnidæ*). In this group the shell is equivalve and the ligament external, and the animal may be attached or free. The mantle lobes are closely united, and the foot is finger-like. The surface of the shell is ribbed, and its margins are toothed. *T. gigas* may attain a very large size, the shells being known to attain an occasional weight of 500 lbs. They are sometimes used as fonts in Roman Catholic churches.

Tri'dent (Lat. *tridens*), an instrument in the form of a fork with three prongs, used by the ancients in driving oxen and catching large fish. In Greek mythology the T. is the symbol of Poseidon's dominion over the sea, corresponding to the sceptre of other gods.

Trienn'ial Prescrip'tion, in Scotch law. See PRESCRIPTION.

Tri'er (Fr. *Trèves*), a town of Rhenish Prussia, 30 miles N.E. of Luxemburg by rail, lies amid vineclad hills of ruddy sandstone, on the right bank of the Mosel, which is here spanned by an eight-arched Roman bridge. The 2d c. *Porta Nigra* (93 feet high by 115 long) served as a church from 1035 to 1817, when it was reconverted to a statelier city gateway than any France or Italy can boast. There are Roman baths too, an amphitheatre, and a basilica (restored into a noble Protestant church, 1856); while the cathedral itself is mostly Roman, but from its multitude of later styles is rather quaint than beautiful. Measuring 320 by 140 feet, it contains among other relics the Holy Coat (q. v.), and is connected by a cloister with the exquisite little Liebfrauenkirche (1227 43). More noteworthy than any of these is the Igelsaule or Heidenthurm, some 4 miles from the town, a graceful monumental column, 71 feet high, sculptured with spirited bas-reliefs, and dating from the 2d c. The Rathhaus, a Gothic building of the 15th c., has been turned into an hotel, a Roman *propugnaculum* into a coach-house. To modern times belong the gymnasium, containing a museum and town library of 100,000 volumes, the *realschule*, hospitals, &c., and on the opposite bank the Mariensaule, surmounted by a colossal figure of the Virgin. T. has manufactures of woollen, cotton, and linen stuffs, of hats, tobacco, carpets, and leather, and carries on an important trade in cattle, wood, and the wine of the surrounding district. Pop. (1875) 20,027, of whom 2800 are Protestants. The capital of the Treviri and *Augusta Trevirorum* (56 B.C.) of Cæsar, T. from the 3d c. was a frequent residence of the Roman emperors, and under Constantine (306-37) as capital of Gaul rivalled Rome itself. It never, however, wholly recovered the Germanic invasions of the 5th c., though as the seat of bishops (since 329) and

later of electoral archbishops, who down to 1801 bore the title 'Archchancellor of Gaul and the Kingdom of Arles,' it remained a place of consequence. The removal of the last Elector to Koblenz (1786), and the reduction of T. to *chef lieu* of the French department of the Saar (1801–14), left it a mere cathedral city; and, made over to Prussia (1815), it is now 'a quiet, old-fashioned town, with a body of Roman remains far more numerous and varied, if not individually more striking, than any other place N. of the Alps can show.' See Freeman's *Augusta Trevirorum* in *Historical and Architectural Sketches* (Lond. 1876), and the local histories of Haupt (2 vols. Trier 1822), Braur (Trier 1854), Leonardy (Saarlouis 1871), and Wilmowsky (2 vols. Trier 1873–74).

Triëst (Slav. *Tèrst*, Ital. *Trieste*), the principal seaport of the Austro-Hungarian monarchy, and an imperial free town, on a crescent-shaped bay at the head of the Adriatic to the S. of the Triesener Karst, 90 miles S.W. of Laibach by rail. It is the terminus of the railway from Vienna (*Sudbahn*) and of that from Venice, and an important place for the transit trade between the East and the manufacturing centres of Europe. The territory belonging to it, which is enclosed by the Austrian Küstenland (q. v.), has an area of 90 sq. miles, and a pop. (1870), including the town, of 123,093. The old town, built in the Italian style, is huddled together on the slope of the Schlossberg and around the old harbour, and is connected with the new town or Theresienstadt to the E. by the broad, elegant Corso, which opens into spacious squares, adorned with fountains and monuments. To the S.E. of the old town lies the suburb of Josephstadt, and beyond the Theresienstadt that of Franzenstadt, separated by the Torrente, which is crossed by several bridges. The harbour is really an open roadstead, but there are several moles, and the bay of Servola, near Muggia, is the only naval station of Austria. The directors of the Sudbahn, who enjoy a monopoly of the inland communication which for years has been sapping the local trade, have, in connection with their vast through traffic, constructed a spacious private harbour to the N. of T. (completed 1877). The sea-approach to T. is unobstructed by sandbanks, but shipping is exposed to the fury of the Bora or north-east winds. The defences comprise, besides the castle on the Schlossberg, a fort and several harbour batteries. T. is the residence of the Bishop of Capo d'Istria, and its cathedral of St. Justus, crowning the hill, is a singularly interesting double basilica of the 14th c. formed out of a temple of Jupiter, and containing imbedded in its walls pilasters, columns, entablatures, trophies, &c., of the older edifice. The other ancient relic of T. is a small Roman arch (*Arco di Riccardo*), apparently triumphal, showing still on one side its Corinthian pilasters. Other churches are those of St. Peter (1367) with a clock-tower, Santa Maria Maggiore (1627), San Antonio Vecchio, the Greek San Niccolo, the Synagogue, &c. The Tergesteum, a vast quadrangular building of 1842, contains the Exchange, the Austrian Lloyd's offices, a bazaar, grand concert and ball rooms, &c. The finest secular edifice in the old town is the Old Exchange, in front of which are the noble statue of Leopold I., on a marble column 76 metres high (1661), and Mazzoleni's fountain with marble groups (1751). Other monuments are those of Karl VI. on the Piazza Grande, and Ferdinand I. in front of the cathedral, erected 1560. There are schools of navigation, an upper gymnasium, museums of science and antiquities (important Roman collections), a zoological collection, several libraries, &c. T. has no fewer than thirty-four public squares, and in and around it are many imposing mansions and elegant villas. In 1876 the imports amounted to £13,919,490, and the exports to £9,789,637, showing a decided falling off on previous years. The value of Austrian imports was £7,612,176, of British £3,054,763; of Austrian exports £6,614,970, and British £1,132,418. The chief imports are coal, fruits, iron, machinery, cotton goods, colonial produce, petroleum, olive oil, and spirits. There entered the port (1876) 7851 vessels of 985,682 tons, and cleared 7828 of 985,044 tons. T. has considerable shipbuilding, and manufactures soap, cordage, rosoglio, white-lead, leather, &c. Pop. (1870) 70,274, extremely mixed, but mostly Italian-speaking. *Tergeste*, a place of importance in Roman times, had a peculiar destiny standing on the border-land of Italy and Illyria. It was included in the dominion of Theodoric and in Justinian's recovered empire, but it never fell under the Lombard rule. It remained with the lords of Constantinople and Ravenna till it became part of the kingdom of the Karlings. The history of T. is simply that of an Italian city, till by the treaty of Turin in 1381 its independence is allowed by the contending powers; but in 1382 it took the seemingly strange step of submitting to the lordship of Leopold, Duke of Austria. The lordship of T. was at first only an over-lordship, but the bond gradually came to imply bondage, and T. has ever since remained Austrian in allegiance, save during the chaos of the elder Bonaparte's days. The *Italia irredenta* movement caused some disturbances in 1878. See the local histories of Löwenthal (2 vols. Trieste 1857) and Scussa (Trieste 1864), also Freeman's *Historical and Architectural Sketches* (Lond. 1876).

Tri'fle, a fancy confection or dish composed of a basis of fine crisp paste soaked in white wine, over which a layer of custard and cream is placed, the whole being surmounted with a light, delicate white froth, prepared by whisking up white of egg with cream and sugar. The above may be taken as a type of similar preparations which vary endlessly in their combinations.

Trifo'lium. See CLOVER.

Trifo'rium, in ecclesiastical architecture, an arcade surmounting the pier-arches that separate the nave from the aisles. It derives its name from the *three* arches or *openings* (*triforia*) resting upon columns, of which originally it always consisted.

Trigg'er. See BREECH-LOADING ARMS.

Trigg'er-fish (*Balistes*), a genus of fishes belonging to the order *Teleostei* (q. v.) and to the sub-order *Plectognathi* (q. v.), and deriving their popular name from the peculiar nature of the first ray or spine of the first dorsal fin. This ray is very strong, and remains in an erect position until the second ray is depressed, when it falls like the trigger of a gun The T. occurs in tropical seas, and is allied to the urchin-fish.

Trig'la. See GURNARD.

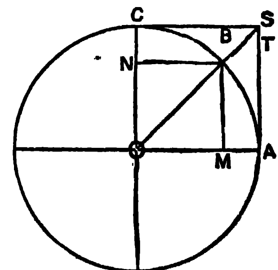
Tri'glyph, an ornament used in the Doric frieze, and consisting of three vertical angular channels or flutes, separated by narrow flat spaces called *femora*. In the Roman examples it is placed over the centre of the column; in the Greek, at the angle of an entablature close up to the angle.

Trigo'nia, a genus of *Lamellibranchiate* Molluscs. In this group, which is typical of the family *Trigoniadæ*, the shell is three-sided and equivalve, and the foot is long and bent. T. itself is represented by a few living species found in Australian seas. Other genera are *Myophoria*, found fossil in Triassic rocks, and *Axinus*, extending in its palæontogical range from the Upper Silurian to the Trias, and specially found in rocks of Permian age.

Trigonoceph'alus, a genus of *Viperine* snakes belonging to the family *Crotalidæ* or that of the Rattlesnakes, and nearly allied to the genus *Craspedocephalus*, of which the dreaded Fer-de-lance (*C. lanceolatus*) of Brazil is a familiar example. The tail in T. ends in a spine, instead of a rattle as in the *Crotalus*, and the head is covered with prominent *scorb* or shields. The *T. rhodostoma* of Java preys on frogs and lizards, and is highly venomous.

Trigonomet'rical Sur'vey See GEODESY; ORDNANCE SURVEY; SURVEY.

Trigonom'etry (Gr. *trigōnos*, 'three-cornered,' and *metron*, 'measure') is the branch of mathematics which, though really based upon the relations subsisting between the angles and sides of a triangle, embraces the consideration of all periodic functions, of which the so-called *circular functions* are typical examples. Let AOB be an angle at the centre of the circle ABC, whose radius is unity. OC is at right angles to OA; while B is taken anywhere on the circumference, between A and C for convenience. AB is evidently the circular measure (see CIRCLE) of the angle AOB. Draw BM parallel to OC and meeting OA in M; and BN parallel to OA and meeting OC in N. Produce OB till it meet the tangents through A and C at T and S respectively. Then the following nomenclature is adopted:—BM is called the *sine* of the



arc AB or of the angle AOB, AT the *tangent*, and OT the *secant;* while the lines BN, CS, and OS, are known as the *cosine*, *cotangent*, and *cosecant* of the angle AOB, since they are obviously the sine, tangent, and secant of the complementary angle BOC. If the circle is not of unit radius, these lines no longer represent the functions so named, which must in such a case be expressed as the ratios of these lines to the radius. Thus

$$\frac{BM}{OA} = \text{sine AOB}; \quad \frac{OM}{OA} = \text{cosine AOB, \&c.}$$

From simple geometry we have the relations AT : OA = BM : OM, and OT : OA = OB : OM, which give other expressions for the tangent and secant; and similar substitutions hold for the cotangent and cosecant. Hence it is evident that the various circular functions of a given angle may be represented by the ratios subsisting between the sides of a right-angled triangle, one of whose angles is the given angle. Thus, representing the angle AOB by the symbol a, and the sides OB, OM, and BM by a, b, and c respectively, the various relations are thus expressed—

$$\sin \alpha = \frac{c}{a}, \tan \alpha = \frac{c}{b}, \sec \alpha = \frac{a}{b}$$

$$\cos \alpha = \frac{b}{a}, \cot \alpha = \frac{b}{c}, \operatorname{cosec} \alpha = \frac{a}{c}$$

From these numerous mutual relations between the several functions may be deduced, as for example

$$(\sin \alpha)^2 + (\cos \alpha)^2 = 1, \tan \alpha = \frac{\sin \alpha}{\cos \alpha} = \frac{1}{\cot \alpha}.$$

The next point which calls for special consideration is the periodicity of these functions. Imagine B to move uniformly from coincidence with A right round the circle in the positive direction, *i.e.*, contrary to the direction of the hands of a watch, until it coincides with A again. During the process, the angle α grows from zero to four right angles, from o to 2π; but how does the sine vary? It begins with zero, and grows gradually till the angle reaches the value of $\frac{\pi}{2}$, or one right angle. At this point the sine is unity, and then falls off to zero as the angle approaches π or two right-angles. Here it passes through zero and becomes *negative*, still continuing therefore to diminish algebraically until, when the angle is $\frac{3\pi}{2}$ or three right-angles, it reaches its minimum, -1, and then approaches zero again as the angle approaches 2π or four right angles. While the point B makes one complete revolution, the value of the sine oscillates between $+1$, and -1, passing through zero twice. In the first and second quadrants it is positive, in the third and fourth negative. The cosine goes through a very similar cycle, except that its value is $+1$ when the angle is zero, -1 when the angle is π, and vanishes when the angle is $\frac{\pi}{2}$ and $\frac{3\pi}{2}$. The cosine is therefore positive in the first and fourth quadrants, and negative in the second and third. The tangent grows from zero to *plus* infinity in the first quadrant, continues to grow (in an algebraic sense) from *minus* infinity to zero in the second, from zero to *plus* infinity in the third, and from *minus* infinity to zero in the fourth. It is therefore *positive* in the first and third quadrants, and *negative* in the second and fourth. The cosecant, secant, and cotangent, being the reciprocals of the sine, cosine, and tangent, follow the same rules as to signs, &c. This question of *sign* is one of extreme importance in all trigonometrical theorems, for which, however, we must refer to the standard treatises by Todhunter and others upon the subject. The simpler theorems, such as the sides of a triangle are proportional to the sines of the opposite angles, the area of a triangle is measured by the product of any two sides into the sine of the contained angle, &c., are directly deduced from the fractional expression given above for the several functions. In treating of spherical triangles (see TRIANGLE), other and more complex relations between the connected functions hold, the treatment of which forms a peculiar branch of T., known as spherical T. The importance of these functions in the practical solution of all mathematical problems other than the very simplest has necessitated the tabulation of their values for all angles between 0° and 90°. For larger angles the values reproduce themselves according to a simple periodic law. In the best tables, such as Chambers' *Mathematical Tables*, the logarithms of the values are tabulated to facilitate calculation.

Trik'hala (the *Trikkē* of Homer), a town of Turkey, in the vilayet of Janina, on the Peneius, 34½ miles W. of Larissa. It has a castle, ten Greek churches, seven mosques, two synagogues, and a Greek college, is the seat of a bishop, and carries on dyeing, tanning, and cotton manufacture. Pop. 10,000. T. anciently possessed a famous temple of Æsculapius.

Triku'pis, Spirid'ion, a Greek statesman and historian, was born at Missolonghi in 1791, and in 1810 was sent to study in London by Lord North, who as Governor of the Ionian Isles chose him for private secretary. Throughout the Greek War of Independence, excepting the presidency of Capo d'Istria, he filled a number of important posts, and under Otto I. was three times envoy to London (1835-38, 1841-43, 1850-62), minister of foreign affairs and public instruction (1843), and president of the senate (1844-49). On Otto's deposition T. withdrew from politics, dying at Athens, February 24, 1873. His *Historia tēs Hellēnikēs Epanastaseōs* (4 vols. Lond. 1853-57; 2d ed. 1862) is perhaps the chief literary product of modern Greece, and T. is also remembered for his funeral oration on Byron, and by a spirited Clepht war-song, *Ho dēmos* (Par. 1821). His son, Constantin, belonging to the Radical party, was president of the council (1875-76), and since 1877 has held the portfolio of foreign affairs in Comoundouros' ministry.

Trillia'ceæ, a small natural order of about thirty species, is now reduced to *Trillideæ*, a tribe of the order *Liliaceæ*, and is distinguished by a creeping rootstock, a stem bearing one or two whorls of reticulate-veined leaves, flowers not jointed on the pedicel, styles free, and fruit a berry. The species are natives of N. temperate regions. *Trillium* and *Paris* are the most important genera. The roots of *Trillium* are generally violently emetic, and are occasionally used medicinally in the United States.

Tril'obites, an important order of extinct *Crustacea*, having a trilobed body with a cephalic or head shield, bearing a pair of compound and unstalked eyes. The segments of the chest were movable, but those of the abdomen were united, and formed a caudal or tail-shield. An upper lip or *hypostome* existed. These fossils are characteristic of Palæozoic rocks. They extend from the Upper Cambrian to the Lower Carboniferous. The body had a well-developed 'shell,' to the presence of which the perfect preservation of these animals in a fossil state is due. The most curious fact concerning the T. is the absence of any appendages in a fossil state save the eyes. The division of the back or dorsal surface into three lobes was not universal, being absent in such genera as *Homalonotus* and *Illænus*. The front portion of the body exhibited the cephalic shield, composed of three pieces—one central and two lateral. The central part or *glabella* protected the stomach of the T., and the lateral parts of the shield were named the 'free cheeks.' The second part of the body or *thorax* varied in the number of its rings from two to twenty-six, the latter number being found in *Harpes ungula*. The caudal shield is named the *pygidium*, and was occasionally prolonged to form a spine-like tail. The zoological position of the T. is hard to determine. Their nearest affinities, however, appear to point to the *Phyllopoda*, represented by the brine shrimps, fairy shrimps, &c., or even to the order *Isopoda*, including the wood-lice. The chief genera of T. are *Agnostus*, *Olenus*, *Paradoxides*, *Asaphus*, *Calymene*, *Homalonotus*, *Phacops*, *Lichas*, *Prœtus*, *Acidaspis*, *Bronteus*, *Harpes*, *Cyphaspis*, &c.

Tril'ogy, a series of three tragedies, each in a way complete, yet each a link in a common chain, such as Greek dramatists produced at the Dionysia, and which, when the usual satyric play was added, formed a tetralogy. The *Oresteia* of Æschylus, comprising the *Agamemnon*, *Choëphoræ*, and *Eumenides*, is the only perfect T. preserved to us from classic times; late imitations are Shakespeare's *Henry IV.*, Schiller's *Wallenstein* (1800), and Wagner's *Ring des Nibelungen* (1876).

Trimethyl'amine ($N(CH_3)_3$), an organic compound which is abundantly present in the liquor in which salt herrings are preserved. When methyl iodide is digested with an alcoholic solution of ammonia, a mixture of various organic iodides is produced, among others the iodide of tetramethyl-ammonium, which being sparingly soluble in water is readily separated by crystallisation. The base is then obtained free by treatment with silver oxide, and the tetramethyl-ammonium hydrate ($N(CH_3)_4OH$) so produced decomposes when heated, yielding T., which is gaseous at ordinary temperatures, readily soluble

in water, and possesses a strong alkaline reaction. With acids it forms soluble salts. There is a similar ethyl compound ($N(C_2H_5)_3$), a powerfully alkaline liquid, boiling at 91° C.

Trimm'er, a statesman who trims his sails to every shifting breeze of politics, the title which, coined towards the close of the 17th c., was assumed by Halifax (q. v.) as one of honour.

Trimm'er, Mrs. Sarah, a writer of books for the young, was born at Ipswich, January 6, 1741. Her father, Joshua T., was the author of some works on perspective, and became tutor to the Prince of Wales (George III.) and Queen Charlotte. It was not till 1780, when she was already the mother of a large family, that Mrs. T. published her first work, *An Easy Introduction to the Knowledge of Nature*, but its success was such that she continued till her death to issue similar didactic productions. Many of these supplied a genuine want at the time, and though their value has gradually diminished with the advance of educational appliances, the authoress deserves the gratitude even of the generations which have been enabled to outgrow her works. She died suddenly, December 15, 1810. See *Life and Writings of Mrs. T.* (2 vols. 1814); Mrs. Elwood, *Literary Ladies of England*; and C. M. Yonge, *Biographies of Good Women*.

Trimor'phism. In certain species of plants two different combinations of reproductive organs occur, long stamens and short styles on some individuals and the reverse on others. This is called *dimorphism*, and we have examples in the flax and the primrose. T. is the existence of three different forms, as in the purple loosestrife. Fertilisation, as a rule, takes place between the male and female organs of the *same height*, consequently securing *cross-fertilisation*.

Trincom'alee, a fortified town on the E. coast of the island of Ceylon, commanding the one natural harbour of refuge in the Indian seas. The entrance is nearly landlocked, and there is deep water close to the shore. The town is irregularly built, and is separated from the fortress by an esplanade. It has several pagodas and mosques, two Protestant churches, and one Roman Catholic church, and carries on a regular intercourse with Madras. Pop. 11,447.

Trincom'alee Wood. See HALMALILLE.

Tring, a market town of Hertfordshire, 31¾ miles N.W. of London by rail, on the Grand Junction Canal, has a Perpendicular parish church, 6 chapels, a market-house, mechanics' institute, assembly rooms, &c., whilst in the neighbourhood is T. Park, a seat of the Rothschilds, built for Nell Gwynne by Charles II. Straw-plaiting, sild-throwing, canvas-weaving, and brewing are the chief industries. Pop. (1871) 3283.

Trin'ga. See SANDPIPER.

Trinidad', the most southerly of the W. Indian Islands and a British possession, lies in 10° 2'–10° 50' N. lat., 60° 56'–61° 59' W. long. It has an extreme length of 65 miles, a breadth of 49 miles, and an area of 1754 sq. miles. It is separated from the mainland of Venezuela by the landlocked Gulf of Paria, which is only 9 miles wide at its narrowest part. The N. part of the island is traversed by a range of mountains 3000 feet high and clothed with luxuriant forests, whose trees yield a great variety of useful timbers and ornamental woods. The S. part of the island is less elevated, consisting chiefly of rich valleys. The climate being hot and moist, and the soil extremely fertile, the natural productiveness of the island is very great; nevertheless only a twelfth part of it is under cultivation. In 1874, 49,877 acres were under sugar-cane, 17,828 under cocoa, 17,393 under ground provisions, and 6547 in pasture. The labourers employed are chiefly Hindu Coolies (q. v.), of whom 13,344 were imported in 1871–75. The staple products are sugar and cocoa, but cocoa-nuts, coffee, and cotton are also exported. Deposits of coal and glance pitch are beginning to be worked, and about 16,000 tons of asphalt are annually exported, this substance being obtained floating on the top of a remarkable freshwater lake near La Brea in the S. part of the island. In 1876 the total value of the imports of T. was £1,666,268, and of the exports £1,636,619, and the total tonnage of the vessels that entered and cleared was 516,828. The pop. at the census of 1871 was 109,638, and in 1876 was estimated at 120,000; and in 1875 there were 87 schools, with 7617 scholars. The capital, Port au Prince, is a handsome town of 22,000 inhabitants, built of stone, and connected by rail with Arinca, in the heart of the sugar-producing district, 16 miles distant. T. was discovered by Columbus in 1498, and named from its three conspicuous peaks, was captured from Spain by a British expedition in 1797, and confirmed to Britain in 1802. It is a Crown colony, ruled by a Governor, assisted by an Executive Council of 3 and a Legislative Council of 13 members, all of whom are nominated by the Crown. See L. Borde's *Histoire de T. sous le gouvèrnement espagnol* (vol. i. Par. 1876).

Trin'ity (Lat. from *triunus*, 'three in one'), **Doctrine of the**, viz., that there are three persons in the unity of one Godhead, involves four principal propositions:—(1), That there is but one God, who is indivisible; (2), that the one indivisible divine essence exists eternally as Father, and as Son, and as Holy Spirit; (3), that the distinction between these three is a personal one; (4), that these persons are distinguished as first, second, and third, to express an order indicated in Scripture.

From the beginning of the 2d. c. the objects of the Christian faith were often summed up in a trilogy, the Father, Son, and Holy Spirit, which formed the foundation of the Rule of Faith adopted at the end of that century, which again developed into what is known as the Apostles' Creed. The object of the Nicene Creed (325) was to settle the points regarding the person of the Son raised in the Arian controversy. It merely mentions the Holy Spirit, without declaring anything as to his nature or relations to the Father and Son. The Arians and semi-Arians meantime regarded him as a created being subordinate to the Son, as the Son was to the Father. It therefore appeared necessary that the Church should make some definite statement on the subject. This was done at the Council of Constantinople (381), which added to the Nicene Creed a declaration of the personality and the equal dignity of the Holy Spirit. The shade of subordination of both the Spirit and the Son to the Father implied in merely saying that the Spirit proceeded from the Father was removed by the addition (Council of Toledo 589) of the clause *Filioque* (q. v.). The doctrine owes its completion and establishment to Augustine (354–430), who applied all the powers of his clear and methodical mind to render it supportable to human reason. As thus completed it was minutely defined in the Athanasian Creed (q. v.), which closed up every opening by which a breath of heresy could possibly enter.

Trin'ity, a river which rises in the N. of Texas, U.S., and flows S.E. through a fertile country to Galveston Bay. Its total length is 550 miles, 90 of which are navigable by large vessels.

Trin'ity Coll'ege, Cam'bridge, was founded by Henry VIII. in 1546 upon the site and out of the revenues of Michaelhouse (1324), King's Hall (1337), and other ancient societies. To the sixty fellowships and scholarships of his foundation Queen Mary added twenty scholarships, and at present there are a master, sixty fellows, seventy-four scholars, and sixteen sizars. The scholarships, which are tenable up to the M.A. degree, have a yearly value of from £100 to £30, the sizarships of about £70; and there are further three annual minor scholarships of £75, and three of £50, tenable for three years, besides sixteen exhibitions for scholars from Westminster, St. Paul's, Lynn, Shrewsbury, &c., and numerous prizes. The fellows, with certain exceptions, must take holy orders within seven years after their M.A., and the college may elect professors or other distinguished literary or scientific men to regular or honorary fellowships. The greatest of all the Cambridge colleges, indeed, the largest college in the world, Trinity is more conspicuous for the extent than the special architectural beauty of its buildings. Noteworthy, however, are Nevill's Fountain, the three great gateways by which the three chief courts are entered, the Gothic Hall with its high-peaked roof, the chapel (re-decorated 1875), the library designed by Wren, and containing nearly 100,000 volumes, the Master's Lodge, with its state-rooms, where royalty and the judges are received, and the rich collection of busts and statues of former members—of Newton by Roubillac, Porson by Chantrey, Byron by Thorwaldsen, Barrow, Macaulay, Whewell, Sedgwick, Tennyson, &c. T. C. appoints the masters of Stone, Uttoxeter, and Stevenage schools, holds the patronage of sixty-three livings, and in 1878 had 2038 members of the senate, 3214 members on the boards, and 535 out of the 2485 undergraduates of the whole university. See Arnold's *Oxford and Cambridge, their Colleges and Memoirs* (Lond. 1872).

Trin'ity Coll'ege, Ox'ford, was founded in 1554, on the site of Durham College, by Sir Thomas Pope, of Tithenhanger,

Hertfordshire. It consisted of a president, 12 fellows, and 12 scholars. Both fellowships and scholarships are open, and to the latter (£80) have been added a Blount Scholarship, Henniker Scholarship (1867), and three exhibitions. T. C. presents to eleven livings, and in 1878 had 90 undergraduates, 235 members of Convocation, and 404 members on the books.

Trin'ity Hall, Cam'bridge, was founded in 1350 by William Bateman, Bishop of Norwich, being specially designed for the study of law. Under the new Statutes of 1863, it is governed by a master (Sir H. J. Sumner Maine since 1877), and has thirteen foundation fellowships (ten of them lay), four law studentships of £50 for three years, sixteen other scholarships of from £70 to £21 per annum up to the B.A. and LL.B. degree, and two exhibitions of £70 for one year. T. H. presents to six livings, and in 1878 had 180 undergraduates, 156 members of the senate, and 528 members on the books.

Trin'ity House was established by charter of Henry VIII., in 1514, as a corporation of 'shipmen and mariners' of England, and was designed for the 'relief, increase, and augmentation of the shipping of the realm,' with powers to make laws and ordinances for that end, and out of their revenues to maintain almshouses at Deptford, and to relieve poor seamen—charities which exist to the present day. By an Act of Elizabeth the corporation was enabled to erect sea-marks; and from the powers under this statute the lighthouse system of Great Britain has been developed. One of the functions of the corporation has always been the regulation of pilots, in respect of which their powers were enlarged by charter of James II. in 1685, and by subsequent Acts of Parliament. Formerly the board had the sole right of ballastage on the river Thames. The board used also to have powers to examine masters and mates in the navy. The corporation (1879) consists of 24 members, including a master, deputy, wardens, and elder brethren, besides a number of younger brethren. Eleven of the 24 members are usually men of high position, while thirteen are experienced commanders of merchant ships. The master and deputy are chosen annually.

Trin'ity Sunday, the Sunday next after Whitsunday, is the Festival of the Holy Trinity. This festival formed the climax to the cycle of festivals commemorating the different events in the Life of Christ, as the doctrine of the Trinity was the culmination of the development of doctrine regarding his person. When the festival began to be observed is disputed; it was made general by a decree of Pope John XXII. (1316-1334).

Tri'o, a musical composition for three voices or instruments, or the second part of a minuet. The latter was originally written in three parts, or for three instruments in the orchestra.

Tripe de Roche, a name given by Canadian hunters to various species of lichens with a blistered thallus belonging to the *Umbilicariæ* tribe. The starch they contain (*Lichenine*) can be utilised either as a jelly or as flour. Unfortunately it is conjoined with a purgative and nauseous bitter principle (*cetrarine*).

Tripett'y, or **Tripatore',** a town in the district of N. Arcot, Madras Presidency, British India, on the right bank of the river Palar, 137 miles S.W. of Madras by rail. It is celebrated for the fine pagodas built on the neighbouring hills, to which pilgrims flock in thousands from all parts of India. As a shrine, it is only second to that of Juggernauth in Orissa; and the high priest is known to derive an immense income from votive offerings. T. has a special manufacture of brass work inlaid with copper. Pop. (1871) 10,423.

Trip'le Alli'ance. (1) The league concluded at the Hague in 1668 between England, Sweden, and the States-General for the protection of the Spanish Netherlands against Louis XIV. (2) The league concluded in 1717 between England, France, and the Netherlands against Spain, which guaranteed the Protestant succession in England. (3) The league concluded in 1795 between England, Russia, and Austria.

Trip'let, in music, a group of three notes played in the time of two, indicated by a slur and the figure 3.

Triple Time, in music, is a common measure of time, in which there are three beats to the bar. In compound T. T. there are six beats, the emphasis falling on the first and fourth.

Tri'pod (from Gr. *tripous*, 'three-footed'), any article of furniture resting upon three feet, more especially tables, caldrons, and bronze altars. The tripods used in the temples were frequently made of precious metals, and richly covered with ornaments. The T. was peculiarly connected with the worship of Apollo: upon it the Pythian priestess at Delphi sat, and it was a frequent prize in the Pythian games, as well as a common reward to a successful choragus at Athens.

Trip'oli, the most easterly of the Barbary States, and a regency of the Ottoman Empire, lies between Tunis and Egypt, and has an uncertain southern boundary. Exclusive of the territory of Barca (q. v.), which since 1869 has been made directly tributary to Constantinople, and of Fezzan (q. v.), which is really independent, the area of T. is about 140,000 sq. miles, and the pop. 1,150,000, in the towns mostly Moors, throughout the country mostly Beduins and Berbers. The country consists of a sandy plain bordering the sea, and from 50 to 100 miles broad, merging on the S. into the stony plain of Hammada, which is succeeded by three mountain-ranges having an elevation of 2800 feet, S. of which the land descends to Fezzan. There are no rivers or lakes, and rain falls but seldom, except on the coast or in the mountains. The climate in the hilly districts is healthy, though liable to extremes; but in the lowlands deadly fevers prevail. The country is generally bare and treeless, a foolish tax having been imposed on every fruit-tree planted, in spite of which, however, the cultivation of the date-palm, fig, olive, and orange is increasing. Wheat and barley of the finest quality, as well as cotton and senna, are extensively grown, but esparto grass is now the most important natural product. Horses of a small size but good breed, cattle, and sheep, are reared in large numbers. Formerly T. enjoyed a large transit trade with the Sahara and the states on its southern border, but this has greatly fallen off of late years, owing to the abolition of the slave trade and the competition of the Niger route. In ancient times T. was successively subject to the Cyrenæans, Carthaginians, and Romans. The last called it the *Regio Syrtica*, a designation which gave way in the 3d c. to that of *Regio Tripolitana* (whence the name T.), derived from its three chief cities, Œa, Leptis, and Sabrata. The Arabs succeeded the Romans, and in 1552 T. was conquered by the Turks, but it was practically an independent kingdom from 1714 to 1835, when the Turks forcibly re-established their authority. It is now ruled by a Pasha, and held by an army of occupation of only 4500 men. There is a good deal of fanaticism in the country, which is occasionally unpleasant for travellers. See Testa, *Notice Statistique et Commerciale sur la Régence de T.* (Haag. 1856), and Rae's *Country of the Moors* (Lond. 1877).

Trip'oli (Turk. *Tarabolûs*), capital of the African state of the same name, stands on a small rocky promontory on the Mediterranean, and probably occupies the site of the ancient Œa. It has twelve mosques, several synagogues, a Catholic chapel, and an indifferent harbour. Girt with high walls, it is irregularly built, and is famed for the beauty of its palm groves. It has steam communication with Malta, and is thus connected with the ports of Italy, France, and England thrice a month. In 1877 the value of its import trade was £300,500, and of its exports £400,700, the chief items of the latter being esparto, ostrich feathers, ivory, butter, and gold dust. T. has also important manufactures of leather, woollens, and silk goods. Pop. 27,000. T. is connected with Malta by a submarine telegraph cable.

Trip'oli (Turk. *Tarabulûs*), a town in the vilayet of Syria, at the foot of Lebanon, on the river Kadisha, 2 miles from its mouth. Its castle was built by Raymond of Toulouse during the first crusade, and seven remaining towers still in good preservation attest its former strength. Its port, El Myna ('the landing-place'), was entered (1876) by 1965 vessels of 135,930 tons, and the exports (grain, fruit, sponges, wool, oil, tobacco, and silk) amounted to £43,980, the imports to 9857. Pop. 25,000.

Trip'oli is a fine-grained siliceous deposit, crumbling easily, and valuable as a polishing material for metals, marble, glass, &c. It has a dry, harsh feel, and a gray or yellow colour. The silica present is derived from the casts of *diatoms*. The name is derived from its having been originally brought from T. in Africa, but deposits occur in Tertiary formations all over the globe.

Tripoliz'za (officially Tripolis, 'three cities'), a town of Greece, capital of the nomarchy of Arcadia in the Morea, 39

miles S.W. of Corinth. It stands on an elevated plain near the sites of the ancient towns Tegea, Mantinea, and Pallantion (hence its name). From 1718 to 1821 it was capital of the Morea, and its pop. reached 20,000. On the 17th October 1821 it was stormed and burned by the Greeks. Ibrahim Pasha retook it, 21st June 1825, but it was again surrendered in 1828. Though much of it has been rebuilt, the pop. now is only 7000.

Tripp'ant, or **Tripp'ing**, in heraldry, is applied to animals of the chase, to denote that they are in easy motion. A lion so moving is said to be *passant*.

Trip'tych (Gr. *tris*, 'thrice,' and *ptyssō*, 'I fold'), an altar-piece in three divisions. In early times altar-pieces seem to have been small and portable, in their oldest form consisting of two leaves or tablets of ivory or wood like the *diptychs* of Roman consuls. In later times the most frequent form came to be that of the T., with a large central division, on which was some sacred pictorial representation, while on the insides of the two wings were pictures corresponding to those on the central piece. When there were more than three divisions it was called a *polyptych*.

Tri'remes (Lat. 'with three banks of rowers'), the common galleys or ships of war among the Greeks and Romans, ordinarily manned by about 200 men, and propelled at great speed.

Trisag'ion (Gr.; Lat. *ter sanctus*, 'thrice holy'), or **Cheru'bic Hymn**, employed always in the mass and in the communion service, was in use in the Church as early as the 2d c. In its original form it was in the exact words of Isaiah vi. 3, with the addition of 'who art blessed for ever. Amen.' Additions were afterwards made, to express both orthodox and heretical points of faith, but most of these were rejected in the Western Church.

Trismegis'tus. See HERMES.

Tris'mus Nascen'tium, or tetanus of new-born children, is a malady which is now seldom met with in this country, except in certain localities where it appears to be endemic. T. N. is said to be common among negro children in the Southern States of America, and it has been and still is common in the island of St. Kilda. At Westmannö, a small islet off the coast of Iceland, 64 per cent. of the infants born die of it between the fifth and twelfth day from birth. Eighty years ago, every sixth child born in the Dublin Lying-in Hospital died within a fortnight after birth, and T. N. was the cause of the death of nineteen-twentieths of these children. Dr. Joseph Clark adopted means to secure the efficient ventilation of the hospital, and the mortality of the children fell at once to 1 in 19¼; and from 1826 to 1833 the mortality was only 1 in 58¼; and but little more than the ninth part of that mortality depended on T. N. The disease seems to depend, essentially, on defective hygienic conditions in the dwelling, dirt and defective ventilation being common to the inhabitants wherever the disease prevails. T. N. generally terminates fatally within thirty-six, often within twenty-four, hours from the appearance of the first symptoms.

Tris'tan, or **Tris'tram**, is the centre figure of a circle of old Celtic myths, which with countless modifications and additions afterwards appeared in all the chief European literatures. According to the story, T., son of Rouland Rise, Lord of Ermonie, and Blanche Fleur, sister of Mark, King of Cornwall, was sent by his uncle to woo vicariously and bring home as bride to the British king the fair Isolt, Yseult, or Ysonde, princess of Ireland. T. does so, but they unfortunately partake of a love charm which is not intended for them. They fall passionately but hopelessly in love with each other. The intrigue was carried on for years, and the story narrates the adventures—grave and gay—which resulted from the somewhat difficult position of the actors. They died simultaneously, and the king generously allowed them to be buried side by side. But 'even in our ashes live their wonted fires,' a vine and a rose-bush grew from the graves, and, meeting, twined amorously their branches together. The most important romance extant on the subject is that composed about 1170 by the Norman-English chevalier, Luce de Gast. The legend got abroad to France, and from thence mixed with the Arthurian myths to Germany, where Gottfried of Strassburg re-narrated part of the story in a lively but immoral poem (1210), which had great popularity in the Middle Ages. Hans Sachs is one among a host of old writers who have treated the subject. The Auchinleck MS. of *Sir Tristram* was published by Walter Scott in 1806. Dr. G. Brynjulfson, in his edition of the *Saga af T. ok Isönd samt Möttuls Saga* (Copenh. 1879): a version composed in 1226, and which appears to be a translation of the first form of the story, attempts to connect it with the Scotch *Sir Tristram*, and to show that Orkney was the point of transition between the North-French and Norman-English romances and Scandinavia. See Bossat, *Tristan et Iseult* (Par. 1865); Bechstein, *T. und Isolt in der Deutschen Dichtung der Neuzeit* (1877), and Kölbing, *Die Nordische und Die Englische Version der Tristansage* (Heilb. 1878).

Tris'tan da Cun'ha, a volcanic island in the S. Atlantic, situated in 37° 6′ S. lat., midway between S. America and the Cape of Good Hope. It was discovered in 1506 by the Portuguese navigator whose name it bears, and in 1816 was occupied by a detachment of British soldiers as an outpost of St. Helena, which is 1300 miles distant. The detachment was withdrawn after the death of Napoleon I. in 1821, but a corporal named Glass, and two sailors from a man-of-war at St. Helena, were allowed to settle on the island with their families. A few whaling men afterwards joined them, and in 1878 the pop. had risen to 97. The island, which is about 20 miles in circumference, rises precipitously from the sea on all sides, and has no safe anchorage. It consists chiefly of mountains from 2500 to 3000 feet in height, culminating in a peak 7640 feet high. Scrub and dwarf pine trees are plentiful, and there are tracts of good pasture and arable land, but cultivation is limited by the fierce winds which prevail, and by the ravages of mice. Cattle-rearing, fishing, and sealing are the chief occupations of the inhabitants, who obtain flour, clothing, tea, &c., from passing vessels, whalers, and men-of-war which occasionally call. The island is nominally under the jurisdiction of the Cape Government, and is included in the diocese of St. Helena. 20 miles distant is an islet called Inaccessible Island, on which two Germans lived an adventurous life in 1871–73, when they were taken off by H.M.S. *Challenger*.

Trit'icum. See WHEAT, and COUCH GRASS.

Tri'ton, a son of Poseidon and Amphitrite, dwelling in their palace in the depths of ocean. In works of art, where T. is frequently represented, he is usually a man above, a fish below, and rides erect over the waves carrying a conch or shell-trumpet, by blowing which he smoothes the sea when it is agitated. In later writers the word is often plural, and in later art numerous Tritons were represented.

Tri'ton, a genus of *Amphibia* vertebrates, including the water-newts of our ponds and ditches. The *T. aquaticus*, *T. cristatus*, *T. Bibronii*, and *T. marmoratus* are familiar species. See NEWT. The name is also given to a genus of Gasteropodous molluscs, of which the *T. variegatus* or Sea Trumpet, the *T. anus* or Wrinkled T., and the *T. distortus* or Twisted T., are examples.

Tri'umph (Lat. *triumphus*), a solemn procession in ancient Rome for the purpose of celebrating a victory. The *Imperator* who was thought worthy of the honour entered the city by the *Porta Triumphalis*, and proceeded in a car drawn by four horses along the *Via Sacra* to the Capitol, where he sacrificed a bull to Jupiter. He was preceded by the Senate and the magistrates, and followed by long files of his captives and of all his army. It was the occasion of a public holiday of the most joyous description, and was looked upon as the highest honour that could be bestowed upon a successful Imperator. Under the empire only the Emperor enjoyed a T., generals in the provinces being considered as his lieutenants. A lesser T. was the *Ovatio*, so called because a sheep was sacrificed instead of a bull. The chief difference was, that, in the latter, the general entered the city on foot, was not preceded by the senate, carried no sceptre, and wore a myrtle instead of a laurel wreath.

Trium'virate (Lat. *tres*, 'three,' and *vir*, 'a man'), the name applied in Roman history to two famous coalitions, the first in 59 B.C. between Cæsar, Pompeius, and Crassus; the second in 43 B.C. between Antonius, Octavianus, and Lepidus.

Trivan'drum, the capital of the native state of Travancore, in the extreme S. of the Indian peninsula, 50 miles N.W. of Cape Comorin, and 2 from the Malabar coast. In the centre is a large fort, which contains a celebrated pagoda, the royal palace, and the courts of law; about 2 miles distant is the Residency of the British Political Agent. There is an excellent high school, hospital, and observatory, all under European superin-

tendence. Among the inhabitants are many native Christians, mostly Roman Catholic, and also descendants of early Dutch and Portuguese settlers.

Triv'et, Nicholas, son of one of the King's Justices in eyre, was born about 1258, studied at Oxford and Paris, entered the Dominican order, and died in 1328. His chief work is a Latin chronicle on the six English Kings of the House of Anjou (1136–1307). It was first published in 1719 by Anthony Hall, and again in 1845 by Thomas Hog for the English Historical Society. T. has considerable merit as a historian. He is careful and trustworthy in his use of authorities, writes well, and breathes a religious spirit.

Triv'ium. See QUADRIVIUM.

Trocade'ro, a fort of Spain, province of Cadiz, 4 miles S.S.E. of Cadiz, captured by the French August 31, 1823. This victory has been commemorated in the name of the *place* in Paris opposite the Champs de Mars, and in that of the permanent building in connection with the Exhibition of 1878.

Tro'chidæ, a family of *Gasteropodous* Molluscs, included by some authorities in the family *Turbinidæ*. In the typical genus (*Trochus*) the shell has a flattened base, and is of pyramidal shape. The aperture is oblique and rhombic in form, and the *operculum* is of horny consistence. The T. are abundant on British coasts. The common Top (*Trochus zizyphinus*) is a familiar species, and the Nilotic Top (*T. Niloticus*) is another form belonging to this family.

Tro'chilus. See HUMMING-BIRD.

Tro'chu, Louis Jules, the defender of Paris against the Germans, was born at Le Palais, in Morbihan, May 12, 1815. In 1835 he entered the special military school at Paris, in 1840 became staff-lieutenant, and in 1841 accompanied the 6th Light Infantry to Algiers. In 1842 adjutant of Lamoricière, and in 1846 of Marshal Bugeaud, he became in the June of 1852 Director of the Staff in the Ministry of War at Paris. In the Crimean War he was adjutant of Marshal Saint-Arnaud, and, after his death, of General Canrobert; became in November 1854 General of Brigade, and at the head of the First Brigade of the First Army Corps covered himself with glory at the storming of the Malakoff, September 8, 1855. At the battle of Solferino in 1859 he led a division, and after the peace entered the war ministry, where he was destined as the successor of Niel. His pamphlet, *L'Armée Française* (1867, 20th ed. 1870), however, which revealed the weakness of the French army and advocated the adoption of the Prussian system, cost him the favour of the Emperor. On the outbreak of the German War he was summoned by Napoleon to the camp at Châlons, and appointed Governor of Paris, and on the popular revolution which followed the disaster at Sedan he became Commander-in-Chief of the army of defence in Paris. T., however, proved a man of plan more than of action, and on the 22d January 1871 he resigned his military command to General Vinoy, and in February his civil authority to the National Assembly of Bordeaux. In March 1872 he brought an action for libel against the editor of *Figaro*, in which he was unsuccessful, while his conduct since September 4, 1870, was subjected to much sharp criticism from the press, in consequence of which he resigned his place as a member of the National Assembly in July, and retired into private life at Belle Isle. He has since written several pamphlets defending his administration. See his *L'Empire et la Défense de Paris devant le Jury de la Seine* (1872). *Pour la Vérité et pour la Justice* (1873), and *La Politique et la Siége de Paris* (1874).

Trog'lodytes (Gr. *trōglodytai*, 'cave-dwellers,' from *trōglē*, 'a hole,' and *dyō*, 'I enter'), the Greek name for a savage Ethiopian people to the S. of Berenice, who dwelt in holes or caves—now a general term for people at a like stage of civilisation.

Trog'lodytes, a name applied in zoology (1) to a genus of *Dentirostral* birds, of which the common Wren (q. v.) (*T. vulgaris*) is the most familiar species; and (2) to a genus of *Anthropoid* apes, represented by two species, the Gorilla (*T. gorilla*) and the Chimpanzee (*T. niger*).

Tro'gon, the name given to a large family (*Trogonidæ*) of *Fissirostres* (q. v.). The bill is short, triangular, and broad at its base, which is furnished with bristles. The wings are of moderate size and rounded, and the tail is long. The tarsi are short and feathered. There are two toes in front and two behind. The *Trogonidæ* inhabit both the Old and New Worlds. Their plumage is, as a rule, brilliant in colour; carmine, green, and gold being the prevailing tints. The disposition of their mouth clearly indicates their insect-feeding tendencies. In the typical genus *T.* the bill has a highly-curved keel, and the nostrils are hidden by plumes. The wings have their fourth and fifth quills longest, and the two front toes are united to the first joint. Other genera included in the family are *Apaloderma*, *Priotelus*, *Harpactes*, and *Calurus*.

Troizk, a town of Russia, government of Orenburg, on the Welka, an affluent of the Ui, which joins the Tobol, 207 miles S.E. of Jekaterinburg. Its great bazaar is the scene of an active exchange trade with the Kirghese. Pop. (1875) 8298.

Troll'ope, Mrs. Frances Milton, an English novelist, the daughter of a clergyman, was born at Heckfield in 1779, and became in her nineteenth year the wife of Anthony T., a barrister-at-law, who died in 1825. During most of her married life she resided at Harrow, and in 1829 she went to America. The result of a three years' residence, her *Domestic Manners of the Americans* (1832; new ed. 1849), was with some justice condemned by our cousins as a caricature, but secured the reputation of the writer for keen observation, incisive criticism, and genuine if sometimes ungenial humour. Henceforth her life was devoted to ceaseless literary labour, and although already more than fifty years of age, she subsequently produced, besides several books of Continental travel, upwards of thirty novels. Many of these are now forgotten, but among others which have some chance at least of permanent popularity are *The Vicar of Wrexhill* (1837; new ed. 1860), *Tremordyn Cliff* (1838), *The Widow Barnaby* (1839), *The Widow Married* (1840), *The Barnabys in America* (1843), *Petticoat Government* (1852), and *The Clever Woman* (1854). During her later life Mrs. T. resided at Florence, where she died 6th October 1863.—**Thomas Adolphus T.**, eldest son of the preceding, was born 29th April 1810, and educated at Winchester and Oxford, and has resided in Italy since 1841. He is a prolific, scholarly *littérateur*. His works comprise *Catharine de Medici* (1856), *A Decade of Italian Women* (1859), *Paul V. the Pope and Paul the Friar* (1860), *La Beata*, a graceful story (1861), *Lindisfarn Chase*, a novel (1864), *History of Florence* (4 vols. 1865), *Durnton Abbey*, a novel (1871), *A Family Party in the Piazzi of St. Peter, &c.* (1877), and *Pius IX.* (2 vols. 1877).—**Anthony T.**, another son, born 24th April 1815, has added fresh lustre to the family name as a novelist. Educated at Winchester and Harrow, he was employed in the British postal service 1834–67, lived for several years in Ireland, and travelled extensively in America, Australia, and Cape Colony. He was an unsuccessful Liberal candidate for Beverley in 1869, and was for some years editor of *St. Paul's Magazine*. After issuing several Irish stories, he first attracted attention by *The Warden* (1855), the continuation of which, *Barchester Towers* (1857), remains one of his happiest efforts. These were followed by *The Three Clerks* (1857), *Doctor Thorne* (1858), *The Bertrams* (1859), *Castle Richmond* (1860), *Framley Parsonage* (1861), *Tales of all Countries* (1861; 2d series 1863), *Orley Farm* (1862), *Rachel Ray* (1863), *Small House at Allington* (1864), *Belton Estate* (1864), *Can You Forgive Her?* (1865), *The Claverings* (1867), *Last Chronicle of Barset* (1867), *Phineas Phin* (1868), *He Knew He was Right* (1869), *Sir Harry Hotspur* (1870), *Vicar of Bullhampton* (1870), *Ralph the Heir* (1871), *The Eustace Diamonds* (1873), *Phineas Redux* (1873), *The Way We Live Now* (1874), *The Prime Minister* (1875), and *The American Senator* (1877). Peculiarly the novelist of clerical life, T. is thoroughly English in feeling, and, though lacking depth and keenness, has a power of piquant characterisation, and a style that charms by its fluent grace. T.'s morality is not ideal, but it is genuine. His heroines in particular are models of grace, refinement, and purity; they breathe the sweet air of English homes, and throw an irresistible charm over even the conventional forms of English society. He is the author of several agreeable books of travel —*The West Indies and the Spanish Main* (1859), *North America* (1862), *Australia and New Zealand* (1873), and *South Africa* (2 vols. 1878).

Trom'bone, (1) a large musical wind-instrument, formed of brass, and composed of two separate parts or slides fitting into each other. By the manipulation of the slides the tube of air is altered in length, and the pitch accordingly varied. Trombones are

of three kinds, alto, tenor, and bass, with the following compasses:—



Two or three notes more may be produced, but they are difficult and uncertain, and these are the safe compasses. The T., when judiciously used, and when its tone is not forced, is a very effective instrument. Its sound is powerful, deep, and full. Glück seems to have been the first great composer who employed it in the orchestra. (2) A powerful reed organ-stop.

Tromp, Martin Harpertzoon, the greatest of the great Dutch admirals, was born at Briel in 1579. His grandfather was a coasting trader, and before he was nine years of age he was taken to sea by his father, whom he saw killed in an action with a Spanish ship in the following year, and whose death he lived to avenge. Captured in the same action, and forced to serve in the Spanish navy for nearly three years, he reappears as a lieutenant in the Dutch service in 1622, and has gained the command of a frigate by 1624. In 1637 he was advanced, as lieutenant-admiral, to the command of a squadron of eleven ships. Two years later he blockaded a powerful Spanish fleet under D'Oquendo in the Downs. An English fleet was sent to preserve neutrality, and its commander, Pennington, informed the belligerents that he was ordered to fight whichever fired the first shot. T. then invited D'Oquendo to come forth and fight, and the Spaniard replying that he had no powder, was offered half of the Dutch stock. The Spaniard remaining at anchor, T. attacked and defeated him, leaving a squadron to watch the English, who, however, were little inclined to spoil the sport. This victory, by which 40 ships were burned and 4000 prisoners taken, spread T.'s fame throughout Europe. He was ennobled by Louis XIII., and knighted by Charles I. in 1642. On 19th May 1652, an encounter in the Channel between T. and Blake, in which the latter was victor, preceded any declaration of war, but on 29th November following T. defeated Blake off Dungeness. After this action, tradition asserts that T. hoisted a broom at his masthead, to signify that he would sweep the English from the Channel. But the English soon again mustered, and under the united command of Monk, Deane, and Blake, engaged T. in a terrific conflict, which began off Portland, and after lasting three days (18th to 20th February 1653), ended with the retreat of the Dutch to Flushing. The English took or destroyed 11 war-ships and 30 merchantmen, killed 2000, and captured 1500 of the enemy. T. knew well the rough, daring, obstinate character of English sailors, and had vainly warned the Dutch, long accustomed to easy successes over the Spaniards, of the danger which his skill and courage were powerless to avert. Again, in 1653 (2d and 3d June), at the head of an undisciplined fleet, he was defeated off the North Foreland with fearful carnage, and the loss of 17 vessels. Monk, while cruising off the Dutch coast, had ordered captive vessels to be 'made short work of,' and on 7th August 1653 T. attacked him within sight of Scheveningen. Struck by a musket-ball, T. fell, while a furious fight was raging round the *Brederode*, which had so often borne his flag victorious. Thirty ships perished in this battle, and both sides claimed the victory. Ruyter (q. v.), who succeeded T. in the chief command, fought under him in all his English battles. T.'s monument at Delft, where he is buried, tells how 'he left to posterity a grand example of mastery in naval warfare, of fidelity to the state, of prudence, of courage, of intrepidity, and of immovable firmness.'—**Cornelius van T.**, son of the preceding, born 1629, fought under Ruyter (11th to 15th June 1666) in the great sea-fight against the English off the Downs, in three battles (7th and 14th June and 21st August 1667) prevented the Anglo-French fleet from landing in Holland, served for Denmark 1676-78, and, just as he was about to take command of the Anglo-Dutch fleet against the French, died at Amsterdam, 29th May 1691. See J. de Liefde's *Great Dutch Admirals* (Lond. 1873).

Trom'sö, a town of Norway, capital of the *amt* of the same name, beautifully situated on the island of T. (5 miles long, between Qvalö and the mainland), 131 miles S.W of Hammerfest. T. has several churches (one Catholic), a 'Latinskole,' a teachers' college, and a museum. It carries on a productive seal and herring (100,000 barrels in 1876) fishery, and exports fish and train-oil to Russia, Germany, and the Mediterranean to the value of £100,000 a year. Founded in 1794, T. had in 1816 a pop. of 300; in 1876, 5454.

Tron Weight, the most ancient system of weights used in Scotland, and though not now legal still lingers in certain rural districts. The tron pound was not well defined in value, but varied from 21 to 28 ounces avoirdupois. The name is derived from the Fr. *trone*, 'a beam' set up in the market-place to weigh heavy commodities.

Troon (Cymric Celt. *trwyn*, a 'promontory'), an important seaport in the county of Ayr, Scotland, 10 miles S.W. of Kilmarnock, and 6 N. of Ayr by rail. Pop. (1871) 2790. T. has a fine harbour, with wet and dry docks, and exports coal and iron. The average shipments for the years 1874-78 were 508,423 tons. Occupying a bare, level spit of land, the sea-winds sweep freshly over the place, and give it the most bracing atmosphere on the Clyde. It is in consequence a favourite resort of summer visitors. Both on its N. and S. shores T. has a splendid stretch of sands, unrivalled in the W. of Scotland. In 1878 part of the links (here known as 'knowes') was laid off as a golfing-ground, and a golf club started. In the neighbourhood is Fullarton House, a fine mansion belonging to the Duke of Portland, with the quaint old church and churchyard of Crosbie close by; and some 3 miles inland from T., on a grassy knoll, stands the historic ruin of Dundonald Castle, in which Robert II., the first of the Stewart kings, died. See the Rev. John Kirkwood's *Troon and Dundonald* (Kilmarnock, 2d ed. 1876).

Troop (Fr. *troupe*, prob. connected with Lat. *turba*, 'a crowd'), a body of cavalry corresponding to but smaller than a company of infantry. Two troops, usually of sixty men each, go to a squadron and eight to a regiment of cavalry.

Troop'ial (*Molothrus*), a genus of *Conirostral* birds, of which the Cow T. (*M. pecoris*) found in N. America, and deriving its name from its habit of associating itself with cattle, is the most familiar species. The head and neck are drab-coloured, and the general colour is a black glossed with green, the upper part of the breast being dark violet. The average length of the Cow T. is about 7 inches. The bird deposits its eggs within the nests of other birds, and thus resembles the cuckoo; the foster-parents attending to the young troopials almost (it is said) in preference to their own brood. The names 'Cow Bird,' 'Cowpen Bird,' and 'Cow Blackbird' are also applied to the T. Another species, the *Dolichonyx oryzivora*, or Bob-o'-Link, also named the Rice T., is a familiar American bird, noted for its devastations on rice-fields.

Tropæ'olum, a genus belonging to *Geraniaceæ*, consisting of about forty species all natives of S. America (two or three extending perhaps to Mexico, and almost confined to the mountainous region on the western side extending from New Granada to Chili. Their hardiness in a temperature above freezing point, combined with singular blending of colours in the flowers, and the diversity of foliage they present, place the genus among familiar and appreciated garden plants. *T. minus* and *T. majus*, introduced into Europe soon after the discovery of America, are the parents of many of the ornamental hybrids now common. The herbage and flowers serve as a salad, and the flower-buds and young fruits make a piquant pickle as a substitute for capers. A powerful acrid volatile oil can be distilled from the plants. The Canary Creeper (*T. aduncum* or *peregrinum*) fully merits its pre-eminence as a garden favourite; its native home is the Andean region, and it was introduced into England in 1775. The beautiful *T. tuberosum* is cultivated in Peru for its tubers, which are an article of daily food. *T. speciosum*, a magnificent species with gorgeous crimson-red flowers, festoons shrubs and small trees in Chili with slender stems 15-20 feet long. One species (*T. azureum*) has blue flowers. The names Nasturtium and Indian-cress applied to the common T. were given at an early date from the coincidence of properties with the ordinary cress and the water-cress, and not from any botanical affinity.

Trope (Gr. *tropē*, from *trepō*, 'I turn'), in rhetoric, a term applied to a word or expression diverted from its original to a figurative signification, and thus including Allegory (q. v.), Irony (q.v.), Metaphor (q. v.), Metonymy (q. v.), Synecdoche (q. v.), &c.

Tropho'nius, the fabled builder of the temple of Delphi, after his death was reverenced as a hero, and had a famous oracle in a cavern near Lebadeia in Bœotia. Pausanias describes (ix. 39) how, after purifying himself, he was drawn through the mouth of this cave by an unseen power, and all that he witnessed there. Don Quixote's fancied visit to the oracle preserves its memory.

Tro'phy (Lat. *tropæum*, Gr. *tropaion*, lit., a memorial of the 'turning' or flight of the enemy), among the ancient Greeks, a monument raised on the scene of a battle to commemorate a victory, consisting of some of the arms, shields, and helmets of the defeated army affixed to the trunk of a tree or to a stone pillar. If a naval victory, it was erected on the nearest land. Trophies were usually dedicated to some divinity, and it was considered sacrilegious to demolish them; but when they became decayed through time, it was not customary to repair them. The Romans generally ornamented the buildings of the city with the spoils of the vanquished.

Trop'ic Bird (*Phæthon æthereus*), a *Natatorial* bird belonging to the Pelican family (*Pelecanidæ*), and deriving its name from the fact that it is rarely seen outside the tropical circle. The T. B. breeds in Mauritius. The colour is white, marked on the back with black. The two middle feathers of the tail are extremely long. The average length is about 2½ feet, inclusive of the tail. The wings are long, and the flight extremely powerful. The voice is merely a shrill note. An allied species is the Roseate T. B. (*P. phœnicurus*).

Trop'ics (Gr. the 'turning-points' or limits), in astronomy, are the parallels of declination between which the sun's annual path in the heavens is contained. The one N. of the equator is called the Tropic of Cancer, the southern one that of Capricorn. The distance of each from the equator is equal to the sun's greatest declination, and is subject to a slight periodic variation. The zone upon the earth's surface which is included between the parallels of latitude corresponding to the T., is itself known as the T., or more correctly the tropical zone.

Tropp'au, the chief town of Austrian Silesia, lies on the Oppa, 106 miles S.S.E. of Breslau by rail. It is surrounded by fine gardens, replacing the old walls and intrenchments, and has three suburbs, six churches (one Evangelical), an old town-hall (lately rebuilt in Gothic style), a large barrack, a higher gymnasium and Realschule, a teachers' training college, a commercial school, and several benevolent institutions. T. manufactures cloth (chiefly military), machinery, beet-sugar, beer, potash, soda-water, lucifers, spirits, liqueurs, and paper. Pop. (1870) 16,608. T. was founded in the 13th c. From the 20th October to the 20th December 1820 a Congress, afterwards transferred to Laibach (q. v.), met at T.

Tross'achs (Gael. 'bristled territory'), a romantic defile forming an approach to the W. Highlands of Scotland, is situated in Perthshire, some 8 miles W. of Callander, and extends for about a mile between Lochs Achray and Katrine (q. v.). The pass, which winds between Ben A'an on the N. and Ben Venue on the S., is confined by lofty rugged precipices, feathered to their summits with birch, pine, and other trees; in the words of Scott, whose name will be associated for ever with the district—

> 'Crags, knolls, and mounds, confusedly hurl'd,
> The fragments of an earlier world.'

Troub'adours and Trouvères', the poets of Provence and Northern France, so called, according to Diez, as the *inventors* of lyric and narrative poetry (Pr. *trobar*; Fr. *trouver*, 'to find,' from Lat. *turbare*, 'to turn topsy-turvy'). M. Paris, however, in *Romania* (July 1878), suggests *tropare* (from *tropus*, 'song') as the true etymon, '*turbare* presenting phonetic difficulties, and failing to explain the meaning.' See PROVENÇAL and FRENCH LANGUAGE AND LITERATURE.

Trous-de-Loup (Fr.), in military operations, are rows of inverted conical pits, each with a pointed stake inside. They are a formidable obstacle to the advance of cavalry.

Trout, a term applied generally to various species of fishes belonging to the salmon family (*Salmonidæ*). Of the T. the best-known species, and that which *par excellence* receives the name, is the *Salmo fario* or Common T., a fish which inhabits clear and running streams, and is mostly to be found tenanting some special nook from which it has to be warily drawn by the fly of the angler. The colour of the T. is very characteristic. It is of a yellowish-brown colour above, variegated with a dark reddish-brown hue, and marked by spots of a brilliant carmine along the lateral line. Below, a silvery white lustre prevails, and the under part of the sides are a rich golden-yellow. The T. subsists largely upon insects, worms, and the like fare. The bait which tempts it varies greatly from the fly to the minnow. A very peculiar and at the same time interesting fashion of capturing T. is in vogue amongst juvenile fishers, and is named 'tickling.' This process consists in feeling beneath the river banks for these fishes, in holes and like situations where they rest; when a fish is touched, the hand is outspread to prevent its escape, while, apparently, the fish, mesmerised by the action of the fingers on its sides, remains sufficiently quiet to permit of its sudden and speedy capture. The colour and flesh of the T. appear to vary with the particular locality in which the fish is found. The average weight of the common T. is from ¾ lb. to 1 lb. Fishes which exceed 1 lb. in weight may be regarded as exceptionally fine specimens. The T. is found in all the large streams and lakes of Britain and of N. Europe at large. A second species of T. is the Salmon T. (*Salmo trutta*), which closely resembles the salmon in its general habits, especially in those relating to migration to the sea, and returning to the rivers to spawn. The Common T. spawns about the end of October, the sexual differences between male and female then becoming markedly apparent in the elongation of the lower jaw of the former; the Salmon T. spawning at about the same period. Certain species of T. are confined to certain lakes or streams, and are not found outside the bounds of these waters. In such cases special markings indicate the specific character of the fishes. Of such cases, a well-known example is the Loch Leven T. (*S. Levenensis*), which inhabits Loch Leven in Kinross-shire, a lake also tenanted by the common T. From the latter the Loch Leven T. is distinguished by its larger size, and by the more pointed form of the pectoral fins. The tail-fin is also more pointed than in the common T., and the flesh is reddish, and wants the white or pink tint of the Common Trout's muscles. The *pyloric cæca*, or blind and pocket-like appendages attached to the hinder margin of the stomach of most fishes (and supposed to represent a *pancreas* or sweetbread), number from 60 to 80 in the Loch Leven T., whereas in the Common T. they are much fewer. A third species of T. is the Great Lake T. (*S. ferox*), common in some of the larger lakes of Britain and Ireland. It may attain a weight of 30 lbs. or more, and has a prominent muzzle, and a square, truncated tail-fin. The colour is a dark brown, tinted with purple. This fish is a greedy feeder, devouring large numbers of smaller fishes, and is taken by night-lines, or by trolling with strong tackle and a small trout for bait. The flesh is coarser than that of the preceding species. Like the Loch Leven T., the Gillaroo T. is limited in its distribution to Lough Neagh and other lakes in the N. of Ireland; and the Lake T. (*S. Lemanus*) is confined to the Lake of Geneva.

In the New World trout are plentifully found. The common Brook T. (*Salmo fontinalis*) is almost identical, if not wholly so, with the Common T. of the Old World. A second well-known American species is the *Salmo confinis*, or N. American Lake T., which appears to find a congenial habitat in deep lakes. Its colour is dark, mottled with grey spots, and it may attain a weight of over 50 lbs. The Red-bellied T. (*S. erythogaster*) occurs in fresh waters in Pennsylvania and New York states, and averages from 1½ to 2 feet in length. The Oregon T. (*S. Oregonensis*) is one of the best-known and localised American species of T., inhabiting the rivers and streams which run from the Rocky Mountains, and resembling the Common T. of Europe both in size and appearance.

Law regarding T.-fishing.—The right of T.-fishing is conveyed along with the lands. No one standing on a highway, or on public ground contiguous to a stream, has a right to angle the stream, which is the property of those through whose ground it flows. (See RIVERS, LAW REGARDING.) In Scotland, where the right of salmon-fishing does not necessarily belong to the riparian proprietor, where one person has a right to the salmon-fishing and another has a right to the T.-fishing, the latter right must be exercised so as not to be injurious to the former.

Tro'ver, in English law, is an action to compel some one having wrongful possession of goods to restore them to the lawful owner. If the goods have been sold or exchanged for others, the plaintiff, if successful, will have pecuniary damage awarded to him.

Trow'bridge, a market-town of Wiltshire, England, on the Biss, 11¾ miles S.S.W. of Chippenham by rail. The 14th c. parish church (restored at a cost of £8000) contains the grave of the poet Crabbe, and other buildings are the market-house, court-hall, &c. T. is a growing place, with thriving manufactures of broad-cloths, tweeds, and kerseymere. It publishes two weekly newspapers. Pop. (1871) 11,508.

Troy (Gr. *Ilion*), the city of Priam, whose ten years' siege by the Greeks is immortalised in the *Iliad*, according to Homer, was capital of the Troad, a coast-region of N.W. Mysia, which, watered by the Scamander and Simois, and traversed by Ida and its spurs, stretched from Cape Lectum on the Ægean to Dardanus and Abydus on the Hellespont. Those modern writers who look on the *Iliad* as a solar myth have relegated T. to cloud-land; those, on the other hand, who discover an historic substratum in the Homeric poem, have hotly contested the city's precise locality. A few have placed it, with Strabo (xiii. 1, 35), at a 'village of the Ilians' (mod. Aktchi-kôi); and others, with the French traveller Le Chevallier (1786), on a height known as Bali Dagh, a mile beyond the Turkish village of Bunarbashi, and 10 miles from the Scamander's mouth. Against both, Grote upheld the traditional site, the hill of Hissarlik, 2 miles from the Hellespont, on which a town, preserving the name of Ilium, and visited as the 'Pergamus of Priam' by Xerxes and Alexander, was founded somewhere between 720 and 550 B.C. And Grote's opinion has been in great measure verified by the excavations of Dr. Schliemann, in 1871–73 and 1878–79, who had confirmed in 1867 the results of Von Hahn's researches (1864) at Bali Dagh, that its limited plateau could never have accommodated more than 2000 inhabitants, and that the small accumulation of soil or debris proved it to have been occupied from no very early date. At Hissarlik, on the contrary, he passed through five successive strata, the first or uppermost containing Greek coins and pottery, a beautiful statue of Apollo, and other Hellenic remains; the second a few bronze implements and fragments of charred wood; the third, at a depth of 13 feet, stone spear-heads, axes, and other implements of the so-called 'Stone Age;' the fourth (33 feet), fine pottery and bronze weapons and utensils; the last (52 feet), stone and bronze weapons intermixed. It is to the fourth stratum that Schliemann refers his later discoveries of a 'steel' dagger, the 'great tower of Ilium' (40 feet thick and 20 high), the triple 'Scæan Gates,' the 'palace of Priam himself,' and the wonderful gold 'treasure of Priam'—objects that, however doubtfully we receive their finder's enthusiastic identifications, have a high archæological value, and prove by their marks of the action of fire the former existence of a city that perished by conflagration. Schliemann himself, however, has had to own that if this were 'wind-blown T.,' we must cease to put faith in the Homeric details, since Hissarlik nowhere rises much over 100 feet above the plain, and its scanty area (335 by 135 yards) could never have held 50,000 inhabitants. See Grote's *Hist. of Greece* (vol. i., ch. xv.), and Schliemann's *Trojanische Alterthumer* (Leip. 1874; Eng. trans. 1875).

Troy, a town in the state of New York, U.S., on the Hudson river, 6 miles N. of Albany by rail. Two steam ferries and a new iron bridge (constructed at a cost of $250,000) connect it with West T. (q. v.) on the opposite bank. It contains 49 churches, a fine masonic temple, the Rensselaer Polytechnic Institute (1824), with 13 instructors and 190 students in 1875, a music hall (recently erected at a cost of $500,000), and numerous hospitals and educational seminaries. Three daily newspapers are published. There are important Bessemer-steel (the oldest in America) and other iron works, large bell-foundries and cotton factories. In 1876 the valuation amounted to $15,539,700, the debt to $846,144, and the annual tax to $532,146. Pop. (1876) 50,805.

Troyes, the chief town of the department of Aube, France, and the old capital of Champagne, in a wide plain on the left bank of the Seine, 103 miles E.S.E. of Paris by rail. The seat of a bishop, its cathedral of St. Pierre, a splendid flamboyant structure, was begun in 1208, but not completed till the 16th c. Other fine buildings are the collegiate church of St. Urbain of the 13th c.; the flamboyant St. Madeleine (1506), St. Nicolas, and St. Pantaleon, rebuilt after the great fire of 1524; the Hôtel-de-Ville of the 17th c., with fine façade; the once famous abbey of St. Loup, now a library containing 100,000 vols. and 5000 MSS., and the Hôtel-Dieu of the 18th c. T. has also a museum, theatre, exchange, celebrated battoirs, &c., and manufactures of woollens, cottons, gloves, hosiery, candles, soap, Spanish white, parchment, paper, brandy, &c. It carries on a large trade in wine, grain, and vegetables. Pop. (1876) 41,275. The capital of the Celtic Tricassi, T. was first called by the Romans *Augustobona*, but later *Tricassio* and *Tricassæ*, and since the 5th c. *Trecæ*, hence its present name. T. was the birthplace of Urban IV., and the place where was concluded between England and France the treaty of 21st May 1420. It was the headquarters of the Austrian army of invasion in 1814, and was taken by the Germans, under Prince Friedrich Karl, November 10, 1870. See Boutiot's *Histoire de T. et de la Champagne Méridionale* (Troyes 1873).

Troy Weight, a system of weights used in Great Britain for gold, silver, platinum, and precious stones. The Troy pound contains 12 ounces, 240 pennyweights, and 5760 grains, being thus less than the avoirdupois pound, which contains 7000 grains. The old apothecary's weight, which had the same value of pound as the Troy, but subdivided into 12 ounces, 96 drachms, and 288 scruples, was abolished by the Weights and Measures Act of 1878, and the new apothecary's weight made the same as the avoirdupois. The name Troy was given to the standard pound in 1495. The origin of the name is doubtful, some deriving it from *Troy Novant*, the monkish name of London, others from Troyes in France.

Truce, a suspension of hostilities between two nations or armies for a definite period, during which neither is at liberty to do anything to benefit itself at the expense of the other. The word T. contains the same root as *truth*, and implies that the agreement is meant to be honestly kept.

Truce of God. See GOD'S TRUCE.

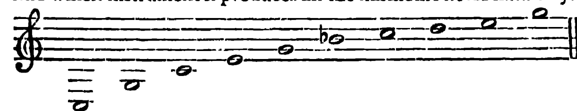
Truck System (Fr. *troquer*, 'to barter;' hence Lowl. Sc. *trog*). This name is applied to a practice, formerly widely extended in Great Britain, of paying workmen in goods in lieu of money. Employers established stores at which the workmen were supplied with food, clothing, &c., to the value of their labour; or if money was paid as wages, they were compelled to purchase at these stores. Such an arrangement afforded opportunities to any unscrupulous master of taking mean advantage of his workmen, and as a rule this was regularly done, trashy and shortweighted goods being priced exorbitantly. The whole system was demoralising and corrupt. Among other evils it induced habits of improvidence and intemperance among the men. The T. S. was abolished in 1831 by the Truck Act, which provided that payment of wages was to be made only 'in the current coin of the realm.' The Act, however, continued to be systematically evaded. An investigation, conducted in 1854 at the instance of Parliament by Mr. Tremenheere in England and Wales, and by Mr. Hill Burton in Scotland, clearly proved this; and again the evidence taken in 1870 by a Truck Commission appointed by Act of Parliament, showed that while direct violation of the Truck Act was rare, kindred abuses were widely prevalent. The evils were supported by the 'long-pay' system, *i.e.*, the practice, which was general, of paying wages once a fortnight or once a month. During the interim few workmen with families could do without cash or its equivalent; part of their earnings were accordingly sought in advance of pay-day, and the sums advanced were expected to be expended at stores carried on for the benefit of the employers who paid the wages. In the mining and manufacturing districts of Scotland, 'poundage' to the extent of one penny per shilling or one shilling per pound was deducted from advances, and if a workman 'sloped the store' his advance-book was 'stegged,' so that the next time he applied for an advance it was refused. Continual shunning the store eventually led to the discharge of the offender from the mine or factory. Truck by evasion flourished in the coal and iron trades of S. Wales, and in Shetland it was reported that of a population of 30,000 two-thirds were 'trucked,' while the remainder were engaged in 'trucking.' The Truck Commission recommended that a 'short-pay' system be made imperative, but Government did not con-

sider it advisable to legislate further on the matter. It was said that the publication of the Commissioners' report had been the means of suppressing the abuses to a large extent, and that with energy and combination on the part of the workmen the T. S. in all its branches could be extirpated.

Truf'fle (*Tuber*), of the natural order *Tuberacei*, is a genus of Fungi growing under ground. Several species are collected as an aromatic flavouring agent for culinary purposes. The English T. is principally *T. æstivum*, of ovoid form, 2 to 3 inches long, black and warted externally, with a marbled flesh when cut across. It is met with in woods (often beech) on a calcareous soil, and for searching it a particular breed of dog is employed, the mode of discovery being by smell. In continental Europe sows are trained for a like purpose. The best French T. is *T. melanosporum*, with an exquisite strawberry-like flavour. Piedmontese T. (*T. magnatum*) is smooth outside and pinky-white within; it has a garlic flavour, and is much esteemed. *T. cibarium*, the black T. of middle and S. Europe, attains a weight of over a pound: either roasted or as a condiment it forms an aromatic food. *T. rufum*, found frequently in vineyards, is much used for food. To the genus *Chairomyces* the white T. (*C. meandriformis*) belongs. It grows to a large size, but is of an inferior quality, and is rare in England. The Australian T., called 'native bread,' is *Mylitta Australis*, a genus of uncertain affinities. This fungus sometimes attains the size of a cocoanut, is a fair esculent, and eaten by the natives. See Planchon, *La Truffe* (Par. 1875).

Trum'bull, John, an American painter, son of the governor of Connecticut, was born at Lebanon, in that state, 6th June 1756, graduated at Harvard in 1773, and served in the army for four years, for some time as Washington's aide-de-camp. In 1780 he passed to Paris to study art, and thence to West's studio in London, where, during the excitement caused by André's execution, he was seized as a spy and imprisoned for eight months. His after life was spent partly in England, partly in America, principally engaged with his art, but occasionally occupied in the diplomatic service of his country. After being for many years president of the American Academy, he died at New York, 10th November 1843. His early works, 'Bunker Hill,' 'Death of Montgomery before Quebec,' and 'Sortie from Gibraltar,' are greatly superior to his ambitious efforts in the Capitol at Washington; and of the decline in his art he was himself conscious, for he relinquished original work and disposed of his collection to Yale College for an annuity of $1000. T.'s pictures show dramatic feeling, vigorously rendered, but are mainly valuable for the faithful portraits they contain—among others, that of Washington.

Trump'et (Ital. *tromba*), a musical wind-instrument with a ringing and clear tone. It is formed of a single curved tube of brass or silver, and is fitted with a mouthpiece at one end and a bell at the other. The pitch is an octave higher than the horn, like which instrument it produces all the harmonic notes naturally.



But by means of artificial contrivances, keys, &c., the others are obtainable. For power the open notes must be relied on. Its natural key is C, though by means of crooks and lengthening pieces the sounds produced may be of any key, and there are consequently trumpets in all keys. High trumpets are called clarini. Latterly it has become common in orchestras to use the cornet-a-piston in place of the T., but no pistoned instrument possesses the true T. tone. The T. was called into great requisition by Handel.

Trump'eter, a soldier in a cavalry or artillery regiment whose duty it is to sound on the trumpet the various regimental calls and signals.

Trump'eter (*Psophia*), a genus of *Grallatoria!* or Wading Birds inhabiting S. America, and represented by the *P. crepitans* or Golden-breasted T. and other species. It is so named from the deep, hollow sound it emits. The T. is readily tamed, and becomes a household favourite. The head and neck are glossy black, the back is grey, and the wings and under parts black. The feathers of the back are long and silky. The body is relatively small when compared with the legs. The bill is vaulted towards the tip, which overhangs the lower jaw. The fourth, fifth, and sixth quills are the longest, and the tail and hinder toe are short.

Trump'eter-Fish, or **Sea-Snipe**. See BELLOWS-FISH.

Trumpet, Sea (*Triton variegatus*), a species of Gasteropodous shells, also named the Conch Shell, attaining the length of a foot, and common in the South Seas, where it is used by the natives as a trumpet. The S. T. is of a white colour, streaked with brown and yellow. The outer lip is large and ribbed.

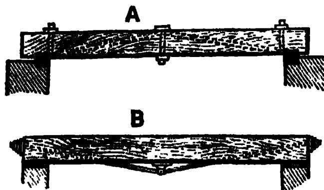
Trumpet-Flower, a name popularly applied to large tubular flowers, such as those of various species of *Bignonia*, *Tecoma*, *Catalpa*, *Solandra*, &c. The natural order *Bignoniaceæ* (q. v.) is called the T.-F. family; and *Bignonia* or *Tecoma radicans* as also the handsome *B. capreolata* are the T.-F. of the United States.

Tru'ro, a city of Cornwall, 53¾ miles W.S.W. of Plymouth by rail, stands at the head of a tidal creek formed by the confluence of the Allen and Kenwyn. In April 1878 it was resolved to replace the dilapidated St. Mary's Church (1518–1769) by a cathedral, subscriptions for which amount (April 1879) to £30,000, £20,000 more being needed. The new edifice, designed in Early Pointed style by Mr. J. L. Pearson, A.R.A., will be 250 feet long by 75 feet wide. Other buildings are three modern churches; the town-hall and market-house (1847), a granite Italian edifice, with the Stannary Courts in its rear; the public rooms (1868), in Tudor style, comprising the County and Bishop Phillpotts' libraries, a masonic hall, and a free assembly-room; the grammar-school; and the Royal Cornwall Infirmary (1779). As centre of a great mining district, T. carries on a considerable trade, its exports amounting (1877) to £6617 (£37,715 in 1873), customs to £7576, and imports to £156,774. There entered (1878) 759 vessels of 72,330 tons, and cleared 807 of 74,485; and on December 31 of the same year 56 vessels and 80 fishing-boats were registered as belonging to the port. Mining, shipbuilding (27 vessels of 2291 tons in 1874–78), and fishing (employing 132 hands in 1878) are the chief industries of T., which publishes three newspapers and returns two members to Parliament. Pop. (1871) 11,049. T., which emerged in history about 1175 as *Triueru* (Corn. 'three ways'), was one of the 'cordage towns' in 1305; gave birth to Samuel Foote, the brothers Lander, and Dr. Wolcot ('Peter Pindar'); and in 1877 was selected as the seat of the revived Cornish bishopric. See W. H. Tregellas, *Cornwall* (Lond. 1878).

Truss, an instrument used in the treatment of Hernia (q. v.) with the view of preventing its descent. A *single* T. is a spring surrounding the abdomen, above the spines of the ilia, terminating at one end in a pad, and at the other in a strap with button-holes. On the back of the pad there is a button to which the strap is secured, and the T. is prevented from displacement upwards by a strap, looped on its back part, brought under the thigh, and also buttoned on the pad. The T. may be adapted to either side, as required; and when there is a hernia on both sides, the spring has a pad at each end, and they are kept in position by a strap passing from one to the other. In the *spiral-spring* T. the pad has a spiral spring coiled in it, and the body-spring does not encircle the pelvis, but terminates in a larger pad on the loins, in which also a spiral spring is coiled, and which is attached to the pad by a strap passing round the sound side of the body. The *ball-and-socket* T. has the pad mounted on a ball-and-socket or universal joint, and in the single form the spring encircles the sound side of the body, crossing in front of the pubes, so as to direct the pressure of the pad up the inguinal canal. The *moc-main lever* T. derives its name from the pith of the silk-cotton tree, of which its pad is formed. A soft belt encircles the body, and to this the pad is attached, carrying a horizontal lever-spring which passes across to the opposite end of the belt. A good T. should fit accurately into the hollow between the buttocks and loins, and should be so closely applied to the hips as not to shift in the movements of the patient's body; but it should not be so tight as to gall the skin, nor should the end of the spring project against the wall of the belly.

Truss, in carpentry, an assemblage of timbers framed together and possessing perfect rigidity: one of the principal supports of a Roof (q. v.). The principle of the T. has been widely adopted in bridge-building. A Console (q. v.) is also called a T.

Truss'ing, a method of strengthening a wooden beam against sagging or deflection by placing within it a truss of iron or oak. A (see fig.) represents a 'truss-beam' with *cast-iron* rods inserted, and B another having *wrought-iron* tension rods not wholly enclosed in the beam.



Truss-Beams.

Trust, in the law of England and of Scotland, is a confidence affecting real or personal estate, reposed by some one in another. He in whom the confidence is placed is called the *trustee*, and he in whose favour the T. exists is called *Cestui Que Trust* (q. v.), or, in Scotland, the *beneficiary*. Trustees are accountable for the interest which they make, or might make, from the employment of money in their possession. The office of T. under a will or marriage-contract is purely honorary. Trustees for behoof of creditors are paid according to their trouble and to the magnitude of their transactions. 10 and 11 Vict. cap. 96 provides means for securing T.-moneys, and for relieving trustees from the responsibility of administering T.-funds when they wish to be so relieved. A trustee may not invest on personal security, or in stock of a private company, unless he is authorised to do so by the T.-deed. By Lord St. Leonards' Act, trustees and executors are authorised, unless forbidden in the T.-deed, to invest in the stock of the Bank of England, or in that of the Bank of Ireland, or on real security in any part of the United Kingdom; and in any security the interest of which is guaranteed by Parliament, and in consolidated stock issued by the Metropolitan Board of Works. If empowered by the T.-deed, trustees may lend on personal security; but joint-trustees may not lend to one of themselves, nor may they lend the T.-funds to accommodate any one; nor, unless authorised to do so, may they invest in any foreign fund. By the Debenture Stock (1871) Act, when a trustee is empowered to invest in the mortgages of a railway, or other specified kind of company, he may, unless forbidden under the T.-deed, invest in the debenture stock of such company. When a trustee is in doubt as to his duty, he should ask the sanction of a court of law before acting. He will be allowed full costs, but not the costs of an appeal. A trustee requires to act with great caution, and he must do nothing in his office by which any kind of profit will accrue to himself. A trustee for an estate of land had better not shoot over it, nor fish in its streams. A trustee retaining T.-funds in his possession may be liable to penal interest, and possibly to interest with annual rests. The essential principles of the laws of England and of Scotland with regard to T. are the same.

Trustee'. See TRUST.

Truxill'o, or **Trujill'o**, a town in the N. of Peru, 9 miles from the port of Huancacho. Except Lima, it is the only walled town in Peru, and it is well built and laid out, though decayed. Founded in 1535 by Pizarro, who named it after his native town, T. was under the Spanish viceroys a place of the greatest importance. Pop. 15,000.

Truxill'o, or **Trujillo**, in the province of Caceres, Spain, 60 miles N.E. of Badajos, is a picturesque but decaying town, noted as the birthplace of Pizarro. Pop. 5000. The ancient *Trogilium*, or *Turris Julia*, T. was held by the Arabs from 711 to 1185, when it was taken by Alphonso of Castille.

Try'gon. See STING-RAY.

Try'-sail, a fore-and-aft sail, with a boom and gaff, on a small mast abaft the lower mast of a ship.

Tsar'skoe Se'lo ('imperial town'), a town of Russia, province of St. Petersburg, 18 miles S. of the capital by rail. It contains eight churches and two palaces, the principal summer residences of the imperial family. The larger of these, built by Elizabeth in 1744, and embellished at great expense by Catherine II., is a noble building, though overladen with false ornament. It has a frontage of 782 feet, and contains a ball-room 141 feet long and 50 feet broad. In one of its wings is a marble gallery 270 feet long by 26 wide, with a noble Ionic colonnade adorned with bronze busts of the most famous men of antiquity. The great park, one of the most carefully planted in Europe, contains a Turkish kiosk, a Chinese hamlet with a pagoda, a bridge built of Siberian marble over a canal connecting two lakes, a marble statue of Count Orlof, and the artificial ruins of a Gothic castle, in the chapel of which stands the marble statue of Christ by Dannecker, erected in 1824 by Maria Feodorovna at a cost of 30,000 roubles. In the armoury is a large collection of armour, weapons, dresses, and relics of historical persons, while the model-farm contains Tyrolese, Swiss, and Dutch cattle, besides buffaloes and bisons. N.W. of the town is Pulkova, the central Russian observatory. Since 1841, T. has been the scene of great annual horse-races. Pop. (*St. Petersb. Cal.* 1878) 14,165.

Tschi'ta, or **Chi'ta**, the capital of the Russian province of Transbaikalia, Siberia, on the river Ingoda, an affluent of the Amoor, at the base of the Yablonoi Mountains, 255 miles S.W. of Nertchinsk. It has great fairs, and is an important place of trade. Pop. (1873) 2598.

Tschu'di, Egid'ius, or, as he wrote himself, **Gilg Schudi**, the father of Swiss history, was born at Glarus in 1505, of a family of which several members have been distinguished in war, politics, and science [see Blumer, *Das Geschlecht der T. von Glarus*, St. Gallen 1853]. He studied under Glarean in Basel and Paris, was in 1533 and 1549 high bailiff at Baden, and for some time a captain in the French service, afterwards travelling much among the Swiss mountains in search of materials for his historical studies. T. several times acted as a mediator in the religious disputes of his time, but himself continued a Catholic. In 1558 he became 'Landammann' of Glarus, in 1559 he was envoy to the Kaiser Ferdinand I. He died February 28, 1572. The chief of his numerous historical works is the *Chronicon Helveticum*, embracing the period 1000-1414 (*editio princeps*, edited by Dr. J. L. Iselin, 2 vols. fol., Basel, 1734-36). The dramatic descriptions of this book Schiller declared to be 'both homely and Herodotean, nay Homeric,' and used amply in giving local colour to his *Wilhelm Tell* (q. v.). Rilliet (*Les Origines, &c.*, p. 290) notes that it was T. who first gave precision to the circumstances, dates, and persons of the Tell legend. Many unpublished MSS. of T. are preserved in the libraries of St. Gallen and Zürich. See Fuchs, *Ægidius T.'s Leben und Schriften* (2 vols. St. Gallen, 1805); Vogel, *Ægidius T., als Staatsmann und Geschichtsschreiber* (Zür. 1856).—**Johann Jakob von T.**, traveller and naturalist, born at Glarus, July 25, 1818, studied at Leiden, Neuchâtel, Zürich, Paris, Würzburg, and Berlin, travelled in Peru 1838-43, and in 1857-59 visited Brazil, the La Plata States, Chili, Bolivia, and Peru. In 1859 he was appointed Swiss ambassador to Brazil. After his return (1861) he was appointed ambassador to Vienna. His works are *System der Batrachier* (Leiden 1838), *Untersuchungen über die Fauna Peruana* (St. Gallen 1844-47), *Peruanische Reiseskizzen aus dem Jahr* 1832-42 (*ib.* 1846), *Die Kechuasprache* (2 vols. Vien. 1853), *Reise durch die Andes von Süd-Amerika* (Gotha 1860), *Die Brazilianische Provinz Minas Geraes* (*ib.* 1863), *Reisen durch Süd-Amerika* (5 vols. Leips. 1866-68).

Tset'se (*Glossina morsitans*), a genus of *Muscidæ*, or flies, inhabiting Southern Africa, and noted for the fatal effect of their bite on cattle. The average size of the T. is that of the house-fly. Its colour is brown, striped with four bars of yellow across the abdominal segments. The horse, ox, and dog are equally affected by its bite, according to Dr. Livingstone; whilst man, the mule, ass, antelope, and wild game at large, appear to escape injurious effects.

Tu'am, an old episcopal city and market-town of Ireland, in Galway, on the Harrow, an affluent of the Clare, 125 miles W. of Dublin by rail. It is the seat of a Roman Catholic archbishop (since 1152), under whose immediate direction is the theological college of St. Jarlath. The Roman Catholic cathedral, a modern structure, and one of the finest in Ireland, stands on an elevation to the E., and is cruciform, with a tower and six turrets at the angles. The Protestant see of T. became suffragan to that of Armagh in 1839, and the cathedral of St. Mary was re-opened in 1878 after restoration at a cost of £15,000. There are good Franciscan schools, and the trade, which is local, is chiefly conducted at the weekly markets and the nine annual fairs. T. has two weekly

newspapers. Pop. (1871) 4938, of whom 4286 were Roman Catholics. In the Irish *Annals* T. is called *Tuaim-da-Ghualaun*, 'the tumulus of the two shoulders,' 'evidently from the shape of the ancient sepulchral mound from which the place has its name' (Joyce, *Irish Names of Places*, Dub. 1869).

Tuar'icks or **Tawâr'ek**, more correctly **Tuar'eg** (pron. Tuarej), a nomadic race of Berber origin inhabiting the Sahara between 5° W. long. and 13° E. long, and across its entire breadth. They are the finest of the Sahara races, being handsome and powerfully made, but are fierce and perpetually at war among themselves. They profess Islamism, but are more influenced by pagan superstitions. Their women go unveiled, and take part in public affairs. No reliable estimate of their numbers can be formed. T. is a name of Arabic origin, and *Imoshagh* is the name by which the T. designate themselves. They appear to be a race dating from remote antiquity, and Barth identifies them with a people figured on the Egyptian monuments.

Tu'ber, in botany, is the name given to a thickened, fleshy, underground stem, with usually very small leaves which can be made out only in the young state, but having in some cases, as in the potato, a number of buds concealed in depressions termed *eyes*. Many plants form only one tuber; others, several. Roots also are called *tuberous* when either the main root or its branches are thickened into one or more fleshy masses known as tubers.

Tu'bercle is described by pathologists as being of two kinds, the grey or miliary, and the yellow or crude; but the latter is, strictly speaking, a secondary form of the former. Grey, or miliary T., is 'a greyish-white, translucent, non-vascular body, of firm consistence and well-defined spherical outline, usually about the size of a millet-seed. Although in its earlier stage it is uniformly translucent, its central portions quickly become opaque and yellowish, owing to the retrograde metamorphosis of its component elements. In structure, T., like the other *lymphomata*, consists of lymphatic cells contained in the meshes of a very delicate reticulum. The cells are mostly round, or roundly oval, colourless, transparent, and slightly granular bodies, much resembling lymph corpuscles; and, like these, varying considerably in size. Many of them contain a small distinct nucleus. In addition to these are a few larger cells, containing two or even three nuclei.' Masses of T. may be intersected by vessels belonging to tissues interposed between the component parts of the mass, which softens into a yellow caseous substance called the yellow or crude T. Mixed with these masses of T. there are also 'ill-formed epithelial cells, masses of pigment, crystals and plates of cholesterine, remnants of enclosed and disintegrating tissue, which break down and involve the neighbouring tissues, forming strumous abscesses and ulcers. In some cases the process of softening commences in the tubercular mass, and involves the tissues secondarily; in other cases the softening or inflammation commences in the neighbouring tissues, and gradually invades the tubercles; or the latter may harden, leaving a hard chalky mass called the cretaceous T. In some cases this mass may remain innocuous; but it may give rise to suppuration and be thrown off, a condition frequently met with in phthisical patients.

Pathologists are divided in opinion as to whether there is anything essentially peculiar in T., or if it is merely a form of chronic inflammatory deposit. The researches of recent physiologists have shown that by the inoculation of non-tubercular products, or by artificial irritation of the tissues in the lower animals, products undistinguishable from T. may be generated. If these experiments are applicable to man, the deposit of T. may be regarded as only a more definite form of chronic inflammatory lymph, or as a degraded condition of the nutritive material from which old textures are removed and new ones formed, differing in its origin from the normal plasma or coagulable lymph, not in *kind*, but in *degree* of vitality and capacity of organisation. Others, however, maintain that T. is essentially a morbid product, as distinct as cancer, and that its development depends on a peculiar diathesis, viz., the strumous, scrofulous, or tubercular diathesis.

Tuberculosis, in the human subject, may depend on the development of tubercle as a primary, morbid product, or it may be the result of some exhaustive, suppurative lesion. T., or the tubercular diathesis, is, according to Sir W. Jenner, a form of the strumous diathesis, the leading pathological changes of which are fatty degeneration of the liver and kidneys, deposits or formations of tubercle and their consequences, inflammation of the serous membranes.

It has long been firmly believed in Italy that T. is contagious; and there are instances in which it would appear to be communicable, especially in crowded ships, barracks, and rooms. Dr. Farr says:—'The presence of phthisis in the armies of Europe is probably due, in fact, to the inhalation of expectorated tubercular matter, dried, broken up into dust, and floating in the air of close barracks.'

Causes.—T. is undoubtedly, in some instances, a hereditary disease, the germs of which are born with the individual, and ready to be developed on the least exciting cause; but it is very doubtful whether it is generally so, and we believe that this influence has been very much exaggerated. Impure air, density of population, and overcrowding, have much to do with the development of T. Drs. Bowditch and Buchanan, by independent investigation, have successfully established the fact that there is a decided relation of cause and effect between dampness of soil and consumption. According to Dr. Andrews, of the Chicago Medical College, T. is most abundant near the sea, and diminishes as we recede from it. At equal distances from the sea it prevails at the N. and diminishes towards the S. See PHTHISIS.

Tu'berose (*Polianthes*), a genus of bulbous *Liliaceæ* with creamy-white flowers and long and sword-shaped leaves. The elegant and fragrant T. of gardens and conservatories is *P. tuberosum*, a native of America. It is not only a great favourite in civilised countries, but is highly prized by the natives of the Malay Archipelago, where it is called 'mistress of the night,' its odour being most powerful in the absence of sunlight. In the S. of France the T. is largely grown for perfumery. In parts of Italy it is much cultivated to supply the export demand for the bulbs. The old name of the plant was *Hyacinthus tuberosus*.

Tubic'ola, or **Ceph'alobranchia'ta**. See ANNELIDA.

Tubicol'idæ, or **Gastrochœ'nidæ**, a family of *Lamellibranchiate* Mollusca, in which the shell is equivalve and gaping, and is often cemented to a limy tube. See GASTROCHÆNA.

Tü'bingen, a town of Würtemberg, S. Germany, in the Black Forest district, on a hill on the Neckar 1043 feet above the sea, 25 miles S.S.W. of Stuttgart by rail. The streets are old and irregular, the suburbs new and tasteful. The chief buildings are the Schloss *Hohentubingen* with a fine portal, the University (completed 1845), the Rathhaus, and the Gothic Stiftskirche (1468-83), with the monuments of twelve princes (mostly of Wurtemberg). In 1873 a monument was erected to the poet Uhland, who lived here at the foot of the Oesterberg. The University was founded in 1477 by Eberhard im Bart, Graf of Würtemberg, and consisted of four faculties till 1817, when the Catholic College at Ellwangen was joined to it as a faculty of Catholic theology. In 1818 faculties of economics and natural science were added. Connected with the University (which in 1878 had 87 teachers and 1144 students, a number never reached before) are a library of 220,000 vols., a physiological and anatomical institute, a botanic garden, three chemical laboratories, various scientific collections, a large collection of coins and medals, an observatory (in the Schloss), and a philological seminary. T. has also an Evangelical Theological Seminary, the so-called 'Stift,' founded 1537, a Catholic 'Konvikt,' a gymnasium, and a Realschule. The chief industries of T. are the manufacture of cloth, surgical and other scientific instruments, dyeing, and book-printing. There is a large book-trade; fruit, hops, and wine are largely produced in the neighbourhood. T. was taken by the French in 1647 and 1688. On the latter occasion its walls were demolished. Pop. in 1875 (with the garrison) 10,471 (1266 Catholics and 75 Jews). See Eifert, *Geschichte der T.* (Tub. 1849); Klupfel, *Die Universitat T.* (Tüb. 1877).

Tubip'ora, a genus of *Sclerodermic Corals*, belonging to the order *Alcyonaria* (q. v.) and family *Tubiporidæ*. It is represented by the *T. musica*, or organ-pipe coral, the 'pipes' of the coral representing the *thecæ* or coral-cups. No *septa* or internal partitions are developed. The coral itself is dark red in colour, and the polypes are green, and have eight pinnate tentacles surrounding the mouth. The tubes or pipes of the coral are united by cross partitions of external nature, named *epithecæ*.

Tu'bular Bridge, a bridge formed of a large tube, through the centre of which a railway or roadway passes. A T. B. constructed of timber was thrown over the Rhine at Schaffhausen in 1757; but the most celebrated examples of this kind of girder-bridge—viz., the Britannia T. B. (q. v.) across the Menai Straits, and the Victoria Bridge built over the St. Lawrence at Montreal—are composed of wrought-iron plates riveted together. Some idea of the magnitude of the latter, and engineering difficulties attending the construction, may be formed from the following details:—Total length of the Victoria Bridge, 9144 feet; length of tubes, 6592 feet; weight of iron in the tubes, 9044 tons; area of the surface of the iron work, 32 acres; number of stone piers (60 feet high), 24, with 25 spans; the central one is 330 feet, the others from 242 to 247 feet. The total cost was £1,250,000. See BRIDGE.

Tubula'ria, a well-known genus of Zoophytes or *Hydrozoa*, belonging to the order *Corynida*. *T. indivisa* is a familiar British species, the polypites being enclosed each in a straw-coloured tube. The polypites of T. are provided with two sets of tentacles, one set being much larger than the other, and the generative buds being produced at the bases of the tentacles.

Tu'bulibranchia'ta, a term occasionally applied to a division of *Gasteropoda* (q. v.) in which the gills are placed behind the heart, the shell being tubular, and being either of straight or twisted conformation.

Tuck'er, Abraham, an English philosophical writer, the son of a London merchant, was born September 2, 1705. In 1721 he was entered as a gentleman commoner at Merton College, Oxford, and about three years later he proceeded to the Inner Temple; but the fortune which he had inherited from his father relieving him from all personal need of a profession, he gave up the thought of practising at the bar, and having in 1727 purchased Beckworth Castle, near Dorking, he settled down as a country squire. His leisure was at first divided between farming and philosophy, but after the death of his wife in 1754 the latter became decidedly the predominant occupation of his thoughts, and in 1763 he published, under the title of *Free Will*, a tentative specimen of a great philosophical treatise. To a criticism on this portion he replied in the same year by *Man in Quest of Himself, by Cuthbert Comment*, and at length in 1768 he brought out the first three volumes of the extended work as *The Light of Nature Pursued, by Edward Search, Esq.* The remaining volumes, four in number, did not appear till after his death, which happened in 1774. Though painfully destitute of system and ostentatiously prolix in the treatment of his themes, which range over the whole ground of morals and natural religion, T. has succeeded, by the charm of a spontaneous and vivacious style and the deeper charm of an earnest and yet cheerful and charitable spirit, combined with no small ingenuity of exposition and even originality of thought, in securing the grateful suffrages at once of the professional philosopher and the man of letters—of a Paley and a Hazlitt, of a Mackintosh and a Leigh Hunt. His *Light of Nature* has been frequently reprinted: Hazlitt brought out an abridgment of it in 1807. See *Life of A. T.*, by his grandson, Sir Henry Mildmay, originally prefixed to the edition of 1805.

Tuck'ermann, Henry Theodore, an American author, was born in Boston, U.S., April 20, 1813. He travelled in Europe, resided for some time in Italy, and finally in 1845 settled in New York, where he died, December 17, 1871. Besides contributing freely to periodical literature, he published a large number of separate works, of which it is sufficient to mention *The Italian Sketch-Book* (1835), *Sicily, a Pilgrimage* (1839), *Artist Life* (1847; 5th ed. 1867), being sketches of twenty-three American painters; *Memorials of Horatia Greenough* (1834), *Maga, Papers about Paris* (1867), and *Life of John T. Kennedy* (1871). He also did a good deal of work as an editor.

Tucum and **Tucuma Palms**. See ASTROCARYUM.

Tucuman', a province of the Argentine Republic, has an area of 23,386 sq. miles, with a pop. of 108,953 at the census of 1869. It has a delightful climate, and is very fertile, its chief productions being sugar, wheat, rice, and tobacco; wool, hides, and leather are also exported. The chief town, San Miguel de T., is 767 miles N.W. of Buenos Ayres by rail, and has a pop. of 11,000. It has a cathedral and several convents, and carries on manufactures of sugar, brandy, leather, and saddle-cloths. The declaration of the independence of the republic was signed here on 25th March 1816. The railway from T. to Rosario (q. v.), 586 miles long, was opened 1st November 1876.

Tude'la, the second town of Navarre, Spain, on the Ebro, here crossed by a bridge of seventeen arches, is 47½ miles by rail N.W. of Saragossa. The streets are narrow and irregular, but T. contains several fine promenades and squares, an old castle, and fifty churches. About four miles below the town, the canal known as El Bocal del Rey joins the Ebro, and affords a useful outlet to its industries. These are chiefly cloth and silk goods, soap, and earthenware. Pop. 7300. T., the Roman *Tutela* (watch-tower'), was conquered by the Moors in the 8th c., but after several vicissitudes was finally recovered in 1141 by Alfonso V. On November 23, 1808, the Spaniards under Castaños surrendered here to the French under Moncey and Lannes.

Tu'dor (Cymr. *Tewdyr* = Theodore), the surname of an English dynasty (1485-1603), whose founder, Owen-ap-Meredith-ap-T., a simple nobleman of Wales, married in 1423 Catharine, widow of Henry V. and mother of Henry VI. By her he became the father of Edmund Earl of Richmond, and Jasper Earl of Pembroke, and espousing with them the Lancastrian cause, he fell at Mortimer's Cross (1461). Edmund married Margaret, daughter and heiress of John Beaufort (q. v.); and the fruit of this marriage, Henry VII. (q. v.), founded his claims on his descent from John of Gaunt. He was the father of Henry VIII., the grandfather of Edward VI., Mary, and Elizabeth, and the great-great-grandfather of James I. by his daughter Margaret's marriage with James IV. (q. v.) of Scotland. See Gairdner's *Houses of Lancaster and York* (Lond. 1874).

Tu'dor Style, a term in architecture usually applied to Late Perpendicular (q. v.), but sometimes to Perpendicular generally, or to Elizabethan.

Tues'day (Old Eng. *Tiwesdæg*, 'day of Tiw' or 'Tiu') preserves the name of the Eddic god *Tyr* (q. v.), the old Norse *Tysdagr* ('Tyr's day;' comp. Lowl. Sc. *Tysday*), answering to the Lat. *dies Martis* (Fr. *Mardi*).

Tuff, or **Tu'fa**, a rock formed of volcanic material, such as cinders, ash, and lava, mixed loosely together or cemented into a coherent whole. If formed under water, it frequently contains organic remains.

Tuil'eries, Palais des, so called from the tile-fields which formerly occupied its site upon the banks of the Seine, is probably more rich in momentous historical associations than any other single building in the world. In 1518 Louis de Savoie, the mother of François I., acquired the ground, along with a small mansion erected upon it, by purchase from a certain Sieur de Villeroy. The present palace, or rather, since its destruction by the Commune, the late palace, was begun by Delorme, at the command of Catherine de Medicis. It first appears prominently in history as the scene of the royal marriage-fête which preceded by four days the Massacre of St. Bartholomew. The building was added to and improved by all the subsequent kings down to Louis XIV., and was at one time or another occupied by almost all of them. One of its halls, too, was the scene of the early triumphs of the Opera and the Comédie Française, and it was within its walls that the famous representation of Voltaire's *Irène* took place on the 30th of March 1778, so soon to be followed by the death of the almost deified poet. It is useless here to attempt to sketch the stirring and terrible scenes which took place within and around it during the Revolution, when it was the residence of Louis XVI. and the place of meeting of the Convention. Napoleon I. made it his favourite place of abode, and throughout the present century it has been the residence of the various rulers of France, and the scene of many of the most important acts in the frequent revolutionary dramas. Destroyed by the Commune, May 24, 1871, it is already partly rebuilt, and is apparently to be used as Government offices, while the President of the Republic occupies the Elysée Palace. See H. Robinson's *Parks and Gardens of Paris* (Lond. 1878).

Tu'la, a government of Central Russia, bounded N. by Moscow, E. by Riazan and Tambov, S. by Orel, and W. by Kaluga. Area 11,955 sq. miles; pop. (1870) 1,167,878. The surface is in general level, somewhat elevated on the banks of the Oka and Upa. It is abundantly watered by the headwaters of the

Don, and by the Osetr, Plava, and Upa, affluents of the Oka, the boundary river on the N. The soil is very fertile, 70 per cent. is arable, 10·6 meadow, and 8·6 woodland. The chief productions are corn, beetroot, tobacco, flax, and hemp. T. has also extensive cattle-rearing, and active manufactures of linens, cloth, sugar, and hardware.—**T.**, the chief town, is situated at the junction of the Tuliza with the Upa, 112½ miles S. of Moscow by rail. It is the residence of a civil and military governor, and of an archbishop, and has a religious seminary, a gymnasium, twenty-eight churches, a theatre, and an industrial museum. T. is the Liège or Birmingham of Russia, and has extensive manufactures of iron and steel wares. Its physical and mathematical instruments and cutlery are of fine quality. The royal small-arms factory, founded by Peter I. in 1712, employs 7000 men. T. has also large manufactures of fancy wares, soap, sealing-wax, candles, hogs' bristles, and leather. Pop. (*St. Petersb. Cal.* 1878) 57,374.

Tu'la Metal, a silvery alloy, having a greyish tinge, composed of silver, with small proportions of lead and copper. It is the basis of the famous Russian niello snuff-boxes, &c., popularly known as platinum boxes.

Tu'lip (*Tulipa*), a genus of bulbous *Liliaceæ*, with usually solitary campanulate flowers of six free segments; stamens hypogynous, filaments short, anthers fixed by the base, mobile, linear, bursting inwards; ovary three-cornered; stigma sessile with three radiating lobes; capsule erect, coriaceous. The genus is restricted to the Old World, extending from Western Europe to Japan and the Himalayas; there are about 45 species, of which one is found in Britain. The common garden T. (*T. Gesneriana*) has been cultivated away from its native country of S. Russia and Armenia for upwards of three centuries. The first description given of it is by Conrad Gesner, in a memoir published in 1561. He had seen it in bloom in April 1559 at Augsburg, in the garden of Herwart, who had received the seeds from Byzantium—probably from Dr. Busbecq, who knew the plant as grown by the Turks. It spread rapidly and appeared in most of the botanical books of the second half of the 16th c. Into the Netherlands it was introduced in 1571, into England in 1577 (by James Garret), and into France by Peiresc, who cultivated it in 1610 at Aix, having received it from Tournay. The taste for the T. has since increased, and their bulbs have become an article of commerce; it was carried to a ridiculous extent, and the T. mania reached its height in Holland from 1634 to 1637. At the beginning every one won in the speculation, which was conducted much on the same principle as 'time-bargains' on the Stock Exchange at the present day. But the time soon came when the contracts could not be carried through, and multitudes were ruined. Then the Dutch government interfered and the gambling was crushed. To develop all the beauty of form and colour of which the T. is susceptible requires the greatest care in its cultivation. From seed new varieties are raised, the seedlings blossoming at four to seven years. Hundreds of varieties have been established from time to time, which range under four groups—Bizarres, Byblœmens, Roses, and Selfs. The first have a yellow ground marked with purple or scarlet; the second a white ground variegated with violet or purple of various shades; the third are marked with rose, scarlet, or crimson on a white ground; and the fourth or plain-coloured T. have a white or yellow ground without any marks. The first three of these families are again divided into feathered and flamed according as the intermingled colours are in narrow or broad stripes. Various other species of *Tulipa* are now represented in all good collections of bulbous plants, and the early-flowering fragrant *T. suaveolens* is often seen in window culture. The yellow-flowered *T. sylvestris*, which is naturalised in several parts of Britain, is probably native in Norfolk and Suffolk. It is common in Europe, and in Siberia its bulbs are eaten. T. is derived from the Turkish word *tulipan*, a 'turban,' the rich and varied flowers resembling an inverted cap.

Tu'lip Tree (*Liriodendron tulipifera*) is one of the most magnificent forest trees of temperate N. America, attaining in favourable situations a height of 100–140 feet, with a straight, clear trunk 6–9 feet in diameter. It is the only species of the genus—which belongs to the Magnolia family—and may be recognised by its large three-lobed leaves, with the middle lobe cut square at the end, and large solitary tulip-like flowers having greenish sepals and petals variegated with yellow and orange. The wood is highly esteemed, uniting lightness with strength and durability. It is of a pale-yellow colour, fine-grained, compact, is easily worked, takes a good polish, and is much used by house and bridge constructors, by cabinetmakers, coachbuilders, implement-makers, &c., and by the Indians for canoes. The bark is officinal in the secondary list of the United States Pharmacopœia as a stimulant, tonic, and diaphoretic. The noble appearance of the tree led to its introduction more than 200 years ago into Europe (see Evely's *Sylvia*), where it is appreciated as a great ornament for pleasure-grounds, &c.

Tullamore' (Irish Gael. 'the great hill'), the county town of King's County, Ireland, is situated on a river of the same name, 57 miles S.W. of Dublin by a branch line of the Great Southern and Western Railway. It occupies an oasis in the Bog of Allen, and, owing to its central position, is a place of some importance, having several churches and schools, a county gaol, and infirmary. Besides the railway, it has communication with Dublin and the Shannon by means of the Grand Canal, and does a considerable business in brewing, tanning, &c. Its trade in corn, at one time very large, has much fallen off since the repeal of the Corn Laws. Pop. (1871) 5179, of whom 4597 were Roman Catholics.

Tulle, a town in the department of Corrèze, France, on the Corrèze, 20 miles N.E. of Brive. It is an ill-built but finely-situated town with a much-admired cathedral presenting a mixture of the Gothic and Classical styles. The Maison Sage and a square tower attributed to the Romans are the other buildings of note. T. has manufactures of arms, leather, lace (*Point de T.*), &c., and carries on a trade in iron and agricultural products. Some say it takes its name from a Roman fort called *Tutela;* more probably it first sprang up in the 14th c. round a monastery. Pop. (1872) 11,848.

Tulle, a delicate bobbin-net of silk used for millinery purposes.

Tull'och, the Rev. John, D.D., a Scotch theologian and author, was born June 1, 1823, near Bridge of Earn, Perthshire, studied at the University of St. Andrews, and in 1844 was licensed as a preacher in the Church of Scotland. After holding for some years a charge in Dundee, he was in 1849 presented to the parish of Kettins in Forfarshire, and in 1854, on the death of Dr. Haldane, was appointed Principal of St. Mary's College, University of St. Andrews, an office which he still (1879) holds. T. first attracted notice as a writer in the *British Quarterly* and *North British Review*. In 1855 he obtained the second Burnett prize (£600) on the 'Being and Attributes of God,' and his essay was published under the title *Theism*. Since then T. has been a prolific contributor to the religious and philosophical literature of the day, much of his work being first given to the public through the medium of the lecture-room, and afterwards collected into separate volumes. Of these the most important are *Leaders of the Reformation* (1859); *English Puritanism and its Leaders* (1861); *Beginning Life, Chapters for Young Men* (1861); *The Christ of the Gospels, and the Christ of Modern Criticism* (1864); *Rational Theology and Christian Philosophy in the Seventeenth Century* (2 vols. 1872); *Religion and Theology, a Sermon for the Times* (1875); *Facts of Religion and of Life* (*Sermons*) (1876); and *Pascal* in Blackwood's series of 'Foreign Classics' (1878). In the spring of 1879 T. delivered two very striking lectures at the Edinburgh Philosophical Institution on *The Intellectual and Literary Revival in Scotland in the 18th C.* In 1878 he was chosen Moderator of the Church of Scotland, and discharged the duties of the office with singular dignity and tact. In politics and theology he is a pronounced liberal. He does not believe in the survival of a narrow Establishment; and strenuously and incessantly pleads for as wide a measure of intellectual toleration as is consistent with the claim of Christianity to be received as a unique revelation of religious truth. Of late years T. has been generally recognised as the leader of the 'Broad Church' party in that Communion. In all his work there is the evidence of a masculine, incisive mind; and he speaks and writes with ease, elegance, and force.

Tumkur, the chief town of the district of the same name, in the State of Mysore, India, 43 miles N.W. of Bangalore. It is prettily situated, and surrounded by fruit-trees. Pop. (1871)

11,170.—The *district* of T., which averages 2500 feet above the sea, has an area of 3606 sq. miles; pop. (1871) 632,239. The crops are *ragee*, rice, cocoa-nut, and areca palms. The through traffic, in the hands of *lingayat* merchants, is considerable. The manufactures are cotton cloth, blankets, iron and steel, brass ware, and earth-salt.

Tu'mours (Lat. 'swellings') may be defined as new formations or additions to some parts of the body of a substance organised or partly organised, and not the result of inflammation only. There are some T., however, which owe their origin to inflammatory processes, and there are others which occur congenitally as the result of fœtal inclusion from an abnormal and excessive formation of epidermal tissue, or from obscure causes. The causes operating towards the formation of T. are quite unknown. Hereditary influence is often traceable, more especially in those of a malignant nature; but no reason is known why the disease, after it has been once originated, should be transmitted from generation to generation. There are three well-marked classes of T. which are distinguished from each other both clinically and anatomically. In the one class (*homologous* T.) the substance of the tumour has an anatomical resemblance to some tissues of the body. Such T. gradually increase in size, and displace the neighbouring tissues without invading them. Such are called innocent T., as they in general only produce inconvenience from their bulk, though they may produce fatal results from being situated in a vital part, and from interfering with vital functions. The second class (*heterologous* T.) bear no resemblance, in their substance, to normal tissues; and they are called *malignant* T., as they affect the mass of the blood, causing cachexia and death. Such T. are extremely liable to ulceration, and they invade all the textures of the part in which they grow. When excised they are apt to reappear in remote parts of the body. The third class of T. (*semi-malignant*) differ from the two former classes, both anatomically and clinically, as they very closely resemble in structure the part in which they grow, or the embryonic state of some natural organ of the body. Such T. may recur after complete removal, they may gradually spread to all the neighbouring tissues, and they may ultimately destroy life by ulceration; but they do not affect the lymphatic system, nor make their appearance in remote parts of the body after excision.

Innocent T. are divided into cystic and solid T. The former have been described under Cysts (q. v.). The latter include: *Fatty* T., usually springing from the natural fat of the subcutaneous membrane, or in connection with deeper-seated fat, and attaining a great size; *fibrous* T., harder, rounder, and less adherent to the skin than the fatty, and occurring in connection with the uterus, the nerves, the bones, the testicles, and many other parts of the body; *fibro-cellular* T., containing, in addition to the fibrous element, a variable proportion of cells; *cartilaginous* T., or Enchondromata, generally occurring as outgrowths of the bone, but also in the parotid gland, the testicle, the thyroid body, and other parts; *bony* T., which are rare; and *vascular* T., large, irregular, pulsating masses, composed of enlarged vessels, which may be either arterial, capillary, or venous. See ANEURISM, NÆVUS, CANCER, SARCOMA, and OVARIES, DISEASES OF THE.

Tun (Old Eng. *tunne*, a 'vat tub'), originally a large vessel or cask, but used subsequently as a measure of capacity in various countries. In Britain it was used for liquids, containing 216 gallons for ale and beer, and 231 for wine. A T. of water weighs a little over 2000 lbs., and hence probably the origin of the Ton (q. v.) weight. The measure is not now legal.

Tun'bridge, a quiet country town of England, county of Kent, on the Medway, 5 miles N. of T. Wells, and 27 S.E. of London by the S.-Eastern Railway. It consists of a main street and the growing district of St. Stephen's, and near the bridge over the Medway, which here splits up into several streams, stands the castle (1259), with its well-preserved gatehouse of rich Early Decorated character, having round towers at the angles. In the inner ward are some Norman walls, and the mound on which stood the keep built by the original possessor, R. de Fitz-Gilbert, who had exchanged a manor with the Archbishop of Canterbury. To him succeeded the De Clares, Audleys, and the Staffords, the present family. The old parish church was virtually rebuilt (1877-78) at a cost of £9000. The grammar-school, founded by Sir A. Judd (Edward IV.), rebuilt in 1865, is one of the most richly endowed of the Public Schools (q. v.). The building bears the arms of the founder, and of his Skinners' Company. The new public hall (1875) has a tower 74 feet high. There is a factory of T.-Ware, and the town is encircled by hop-gardens. Pop. (1876) 8209.

Tun'bridge-Ware, a kind of mosaic woodwork, applied to workboxes, desks, cigar-holders, and fancy articles, formerly much made at Tunbridge Wells, but now little seen.

Tun'bridge Wells, an old, fashionable English watering-place, charmingly situated, partly in Kent partly in Sussex, 5 miles S. of Tunbridge by rail. Its chalybeate springs, discovered by Lord North in 1606, were visited by Charles I.'s queen, Henrietta, and immediately became a resort alike of Cavaliers and Puritans, the latter leaving abiding traces not only in the names of Mount Ephraim, Mount Sion, Mount Pleasant, &c., but in the quiet, subdued character for which the place is still remarkable. The chief parade, called the Pantiles from having been paved with pantiles (at the cost of Queen Anne), has interesting associations with Dr. Johnson, Beau Nash, Richard Cumberland, and other celebrities. Here and in the High Street are the principal bazaars and shops for Tunbridge Ware (q. v.). At one end of the Pantiles are the Wells, the waters of which contain steely particles, marine salts, oily and ochreous matter, and a volatile vitriolic spirit. The old church of King Charles the Martyr is built in two counties and three parishes. A new church of St. Peter was opened in 1875, a new Pump-Room in 1877, and a Friendly Societies' Hall in 1878. There are many beautiful drives and elegant mansions in the vicinity. The 'season' extends from July to September. Pop. (1871) 19,410.

Tûn'dras. See SIBERIA.

Tune, in music, may mean a melody or air, also correct intonation or pitch.

Tung'sten, or **Wolf'ram** (W = 184), a white, hard, brittle, and heavy metalloid, occurring as tungstate of iron and manganese in the mineral *wolfram*, which is tolerably abundant in Cornwall. It is usually classed with uranium and molybdenum. Heated in chlorine, it forms the *hexchloride* (WCl_6), which if heated in hydrogen may be transformed into the lower chlorides (WCl_5, WCl_4, WCl_2). T. forms three oxides (WO_2, WO_3, W_2O_5), none of which are basic. Tungstic acid (H_2WO_4) unites with bases in various and often unusual proportions. It exists in two isomeric modifications, ordinary tungstic acid which forms insoluble salts, and metatungstic acid which forms soluble salts. T. also forms two sulphides, the disulphide (WS_2) and trisulphide (WS_3), the latter of which unites with basic metallic sulphides forming *sulphotungstates*, analogous in composition to the normal *tungstates*.

Tungûs', a nomadic people in E. Siberia, belonging to the Mongolian race. Estimated at 70,000 in number, the T. are scattered from the Taimyr Peninsula on the Arctic Ocean to the Amoor River, and the Okhotsk and Japan Seas. They are divided into several tribes, of which the chief are the Tchaponirs and Orotongs on the Tunguska, the Orotchons, Manegers, Dauers, Manguns, and Golds on the Amoor and its tributaries, and the Shibæ in the Ili Valley. The face of the T. is flat, the beard scanty, and the hair thick, black, and long. They dwell in conical huts of birch bark and skins, and live by reindeer-breeding, fishing, and the hunting of furred animals. In December the T. come in their *narts* ('sledges') to the Russian settlements to pay *yazak* ('tax') to the authorities, and buy salt, powder, and metal wares. Their religion is mainly Buddhism over a basis of Shamanism, though the vigorous efforts of Nicholas I. to convert the T. to the orthodox Greek faith have been partly successful.

Tunica'ta, a class of *Molluscoida* or Lower Mollusca, including animals in which the outer layer of the body or *test* contains cellulose, the mouth opening into a branchial sac or breathing-chamber. The heart is a simple tube, and periodically reverses the direction of its blood-currents. The T. may be simple, social, or compound. They are hermaphrodite for the most part, and undergo a metamorphosis. To the T. belong the familiar *Ascidians* or Sea Squirts (q. v.), and such genera as *Clavellina*, *Salpa*, *Pyrosoma*, *Botryllus*, &c. The nervous system, as in all Molluscoida, consists of a single ganglion placed

between the branchial sac and the atrial sac—the latter being the cavity into which the effete water of respiration passes from the branchial chamber. The atrial chamber opens externally by a special (*atrial*) aperture.

Tu'ning, the correct adjustment of the sounds of a musical instrument. Such instruments as the flute and horn are tuned without difficulty, as, if the pitch is altered by accident, it affects every note, and may easily be rectified by varying the length of the pipe. The notes of the organ and pianoforte, however, are unconnected and independent, and require careful adjustment from time to time (see TEMPERAMENT). Stringed instruments, such as the violin and harp, require T. on every occasion on which they are used.

Tu'ning-fork, a steel instrument with two prongs, designed when set in vibration to give a musical sound of a certain fixed pitch. It was invented by John Shore, sergeant-trumpeter to George I. On account of the difference in the Pitch (q. v.) used at various places, there is considerable variety in the pitch of tuning-forks according to the purpose for which they are required. The ordinary T.-F. sounds only one note (usually C in this country and A in Germany); but some are now made according to a German invention, with a slider on each prong, which, according as it is moved up or down, regulates the pitch of the note produced.

Tu'nis, one of the Barbary States, and a regency of the Ottoman Empire, lies between Algeria and Tripoli, and has an extreme length of 440 miles, with an average breadth of 100 miles, and an area of 45,000 sq. miles. Its N.E. extremity is only 80 miles distant from Sicily. Parallel lines running N.E. and S.W. divide the country into four physical regions as follows: (1) The mountain region in the N., with peaks from 4000 to 5000 feet high. It is well watered, and abounds with oak forests. (2) The Tell, also an upland district, consisting chiefly of plateaux. (3) The Sahel, a region of wide dreary plains, now productive only after the infrequent seasons of heavy rain, but thickly studded with ruins, showing that it once supported a large population. (4) The Sahara, which appears to be encroaching on the more fertile lands. Near the border of Tripoli is the Belad-el-Jerid ('land of dates'), a district rendered fertile by artificial irrigation, the water being obtained from subterranean streams. The only stream in T. worthy of the name of river is the Mejerda (the *Bagradas* of antiquity), in the N. Shallow salt lakes of large size are numerous, and the plains in some parts are strongly impregnated with saline matter. Salt, saltpetre, and lead are the principal mineral products of the country. The climate is salubrious, and less extreme than that of Algeria or Tripoli. Where water is obtainable the land is fertile, and cereals and fruit-trees grow well. Cattle and sheep are reared in great numbers, and T. is also celebrated for its fine dromedaries and horses, the last being much in demand for the French army in Algeria. On the coast, sponge and coral fisheries are carried on by Maltese and Sicilians. The overland traffic with the Sahara, once very important, is now of small dimensions. The exports (olive oil, wheat, barley, esparto grass, wool and woollen manufactures, hides, wax, &c.) from the eleven ports of T. amounted (1875) to £790,140; the imports (cotton and woollen goods, leather, silk, timber, wines, &c.) to £720,570. The population consists of Moors, Arabs, Kabyles (who inhabit the mountain districts), and Jews. The last number 45,000, and are a prosperous community. Under the Romans the population of T. is said to have reached 17,000,000, and 150 years ago it was 5,000,000, but at the present time it is estimated at not more than 1,500,000. Famine, produced by drought, and epidemics—notably in 1785, 1829, and 1867—have brought about the diminution. T. was conquered by the Turks in 1575, and paid tribute to the Sultan till October 25, 1871, when he renounced it. The country is ruled by a Bey, who is hereditary, but receives his investiture from the Sultan of Turkey, and is forbidden to declare war, make peace, or cede territory without the permission of his suzerain, whose effigy is borne on the coinage. The Bey is officially styled 'Possessor of the Kingdom of T.,' and in all respects other than those specified his authority is absolute. Besides the capital, T., the chief towns of the country are Susa, Sfax, Monastir, Bizerta, and Kairwan (q. v.). See Rae, *Country of the Moors* (1877), and Desfossé's *La Tunisie; Histoire, Finances, Politique* (Par. 1877).

Tu'nis, capital of the country of the same name, is situated at the head of a salt lake, nowhere more than 6 feet deep, which communicates by a narrow channel with the Gulf of T., an inlet 30 miles long. At the outlet of the lake is situated Goletta, the port of T., whose harbour is a roadstead with good anchorage, and is sheltered except from the N. It was entered (1875) by 632 vessels of 111,091 tons, and cleared by 612 of 108,259 tons, the exports amounting to £299,644, the imports to £476,875. Goletta is connected by railway with T., which is a walled, fortified, and straggling city, whose winding streets are now paved and kept fairly clean. The whole town has been built of materials taken from the ruins of Carthage, 13 miles N.E. The bazaars of T. are good, and some of the mosques are splendid edifices, but Europeans are jealously excluded from them. The Bey's palace is a modern building in the Saracenic style of architecture, internally decorated with great magnificence, but with little taste. There is also a Mohammedan college with 100 students. T. has important manufactures of woollen, linen, and silk goods (which are exported to all the Mohammedan countries bordering on the Mediterranean), morocco leather, olive oil, soap, and perfumes. The population is estimated at about 120,000, of whom 30,000 are Jews and 10,000 Europeans, principally Maltese and Italians. A railway is being constructed from the city of T. to Beja (67 miles), and is to be ultimately continued 45 miles farther W. to join the Algerian railway system.

Tunk'ers (Ger. 'Dippers'), corruptly **Dunk'ers**, and otherwise known as **Harmless People**, are a sect of religionists in the United States who draw their origin from Germany, but have been an exclusively American sect since the beginning of the 18th c. They reject infant baptism, have no professional ministry, refuse to take oaths or to fight, accompany the celebration of the Lord's Supper with love-feasts, washing of feet, &c., discourage marriage, and depend on prayer instead of medicine for the recovery of the sick. As a rule, the T. are Universalists (q. v.). They are in good repute among neighbours for honesty and industry. Statistics, as savouring of pride, they do not allow, but in 1875 their number was estimated at 100,000.

Tunn'el and Tunn'elling, A tunnel is a horizontal or slightly inclined archway driven through a hill or under a road or river for the passage of a railway, canal, roadway, or other purpose. Many extensive tunnels were executed by the Romans to convey water to cities; but in point of magnitude and difficulty of construction these ancient structures have been surpassed by modern works. Tunnelling has been extensively carried out on railway lines, wherever 'cuttings' would have exceeded 70 feet in depth, and in places where proprietors, desirous of preserving the amenity of their estates, have forced the work. The fullest display of scientific knowledge and practical skill is called for in designing and executing a tunnel. Except in the want of light, air, and drainage, it is seldom that the conditions affecting the construction of any two tunnels agree. Tunnels are generally straight, sometimes curved; some are mined from the ends without shafts, but most are opened up from shafts sunk along the line of formation. Unless where dry durable rock is perforated, a lining of brickwork or masonry is necessary. The first step in the construction of a tunnel consists in laying down its centre line on the surface of the ground. This is effected with the aid of a transit instrument placed in a wooden observatory erected on an eminence. Shafts are then sunk to the level of the tunnel, and the direction underground is accurately set down. A tunnel 1 mile long may require five shafts, one near each end and three others between. Permanent shafts for ventilation are lined with brickwork, temporary shafts with timber. A 'sump' or pit is constructed at the bottom of each shaft to collect drainage water, which is removed by pumping. Working from the shafts, a small 'heading' is usually formed right through by boring and blasting, connecting the various shafts and marking out the centre line of the tunnel. The enlargement of the 'heading' to the required size of the tunnel then proceeds 'length' by 'length,' one being completed before another is commenced. A 'length' varies from three to six yards, according as the ground is 'heavy' or 'light.' A timber framework is inserted to support the roof until the masonry or brickwork sides and arches are built. When additional working faces are necessary to expedite the work, a 'break-up' is formed in the heading between the shafts by opening up and

completing a 'length' of the tunnel. Drainage is provided for by an inclined conduit beneath the roadway, and ventilation of the works is effected by forcing in fresh air. The work of excavation has of late years been greatly facilitated by the invention of rock-boring machines. Several important tunnels have been constructed in England. The Box Tunnel, on the Great Western Railway between Chippenham and Bath, is 3200 yards long; greatest width, 30 feet; height above the rails, 24½ feet. It has 7 shafts, brick-lined, the deepest being 300 feet. Woodhead Tunnel, near Manchester, is the longest tunnel in Great Britain, and measures 3 miles 26 feet. Since its construction, a second tunnel has been driven through parallel to it. Kilsby Tunnel, on the London and N.-Western Railway, measures 2398 yards in length, and 27 feet by 23½ feet in section. A quicksand was encountered in driving the heading, causing delay and greatly increased expense; the total cost amounted to £125 per lineal yard. Netherton Tunnel, on a branch of the Birmingham Canal, is 3036 yards in length; section 27 feet by 24 feet. It was cut from 17 shafts (10 temporary), the greatest depth being 344 feet. The Thames Tunnel, under the Thames at Rotherhithe, was commenced in 1825 from designs by Sir I. K. Brunel, and after several irruptions of the river, completed and opened as a public footway in 1843. It has a double passage, 400 yards long, and is now used as a railway tunnel. The cost of construction was £1137 per yard. The London Metropolitan Underground Railway also furnishes a remarkable example of tunnelling on an extended scale; but all these achievements pale before the great Alpine tunnels, which are the grandest feats of engineering skill yet undertaken. Mont Cenis Tunnel, which pierces Le Grand Vallon, 15 miles S.W. of Mont Cenis, was commenced in 1857, and opened as a junction between the railways of Savoy and Piedmont in 1871. The northern entrance (3801 feet above sea-level) is situated near Modane, and the southern (4236 feet above sea-level) at Bardonnêche. The dimensions of the tunnel are—length 7·6 miles, greatest width over 26 feet, height at Modane end 24½ feet, and 11 inches more at southern extremity. The gradient rises to the centre, on the French side 1 in 45, and on the Italian side 1 in 2000. The tunnel is one mile beneath the summit of the mountain; shafts were therefore impossible, and the work was carried through by driving galleries from each end. The centre lines met with wonderful exactness. Mont Cenis Tunnel is straight, lined throughout with brick, and the total cost was £167, 12s. per yard. The excavation was greatly expedited by the introduction of M. Sommeiller's rock-drilling machines, driven by compressed air. Mountain streams were used to compress the air, which was led into the galleries through tubes, and after driving the drills the air escaped into the tunnel and served to ventilate it. St. Gothard Tunnel, commenced in the autumn of 1872, now in progress through the mountain of that name, will when completed be 9·24 miles long. The galleries are being driven from Göschenen on the one side and Airolo on the other, and it is expected that they will meet early in 1880. The altitudes above sea-level are—at Göschenen 3703 feet, at Airolo 3850 feet, and at the summit of tunnel 3873 feet. The perforation is being accomplished with 18 to 20 drills, driven by air under pressure of 8 atmospheres, and making 18 to 20 strokes per minute. The Hoosac Tunnel, Massachusetts—the longest in the United States—was commenced in 1856, and after several suspensions of work completed in 1874. It is 4¾ miles in length, is lined with masonry, has a shaft 1000 feet deep, and cost about £180 per yard. The Burleigh compressed-air rock-drill was used in the excavation. A tunnel (total length 4½ miles) to connect the Bristol and S. Wales railways is at present being driven under the Severn. The crowning enterprise in tunnelling will be the Channel Tunnel, which it is proposed to drive from the South Foreland in Kent to a point near Calais, in France, to join the railway system of England with that of the Continent. See C. F. Gripper's *Treatise on T.* (Lond. 1879).

Tunn'y (*Thynnus vulgaris*), a *Teleostean* fish, belonging to the *Scomberidæ* or Mackerel family, and attaining a length of 4 feet or more. Its colour is a dark blue on the upper parts, and silvery white below, the sides of the head exhibiting a white hue. The T. spawns in May and June, and visits the shores in huge shoals, which fall a ready prey to the fishermen. The T. is fished chiefly on the Mediterranean coasts. Large nets are used, as in mackerel-fishing; the T. being enclosed gradually in huge pockets and killed by blows from clubs. The flesh is nutritious and palatable, and is eaten both in a fresh and salted condition. The body is deep in front, but tapers towards the tail. A single dorsal fin is developed, and the tail fin is markedly forked, the tail being keeled on each side. The American T. (*T. secundo-dorsalis*) is common on the northern coasts of America, and is noted for the oil obtained from its head and abdominal viscera; the liver being rich in this product. The Pacific Albacore (*T. Pacificus*) and Bonito (q. v.) are allied species.

Tun'stall, a town of the Staffordshire Potteries, 2 miles N.N.W. of Burslem, on the Grand Trunk Canal, has two churches, Christchurch (new spire 1863), and St. Mary's (1859) in First Pointed style, a town-hall, literary institute, &c. Earthenware and porcelain are largely manufactured, and there are also extensive iron-works, brick-fields, and collieries. Pop. (1811) 1677; (1871) 13,540.

Tu'pelo (*Nyssa*), a genus of *Cornaceæ*, consisting of trees inhabiting the swamps and river-banks of the N. American continent. The Common T. (*N. aquatica*) attains 30-50 feet, and its wood is much used for naves of wheels, &c. *N. multiflora*, the Forest T. or Black Gum-Tree, has a growth like the beech. Its wood serves for wheels, pumps, bowls, mortars, wooden shoes, and various turners' work. The acidulous fruits are made into a pleasant preserve. *N. uniflora*, the Swamp T., grows to 80 feet, and the wood is used for corks and floats.

Tupp'er, Martin Farquhar, D.C.L., F.R.S., was born in London, July 17, 1810, and passing from the Charter House to Christ Church College, Oxford, graduated B.A. (1831). He studied law, and was called to the bar at Lincoln's Inn, but has never practised, residing chiefly at Albury, Surrey, and twice having visited the United States, in 1831 and 1876. Author of over twenty works, this 'Walt Whitman of Philistia' must be widely known by his *Proverbial Philosophy* (4th series, 1838-72), since it has passed through fifty editions.

Tura'nian (from *tura*, 'swiftness'), the title conferred on a vast family of combinatory or agglutinative languages, which is made to comprise every tongue of Asia and Europe that is not either Aryan (q. v.) or Semitic (q. v.), with the exception of Chinese and its cognate dialects. This family falls, according to Max Muller, into two great divisions, the Northern and the Southern; the Northern being subdivided into five classes, Tungusic, Mongolic, Turkic (see TURKISH LANGUAGE), Finnic (see FINNISH and HUNGARY), and Samoyedic; the Southern into four, Tamulic or the Dravidian Languages (q. v.) of the Dekkan, Bhotiya or the dialects of Bhotan and Tibet, Taic of Siam, and Malaic of the Malay and Polynesian islands. Under these nine classes he groups 116 dialects, and even then he does not stretch the term 'T.' to its widest limits, which with many philologists include Accadian, the language of the Chaldæan inventors of cuneiform, and Basque (q. v.), and by some are extended to North America. Naturally there is a dispute as to the correctness of the term at all; and while Max Müller asserts that the T. languages 'share elements in common which they must have borrowed from the same source, and their formal elements are such that it would be impossible to ascribe them to mere accident,' Peile in *Philology* (Lond. 1877) maintains that the title T. 'had better be avoided, as the agglutinative languages are much too different to give any ground at all for believing that they all belong to the same family. They agree only in the general principle of forming their speech; but no common bond has yet been found to bring together the main groups of the so-called T. peoples; and it is not likely there is any.' This principle, the combinatory, described under COMPARATIVE PHILOLOGY, might certainly have been independently arrived at by different nations, and it is equally rash to regard Japanese as necessarily cognate to Finnish because both are agglutinative languages, as it would be to connect the Semitic and Aryan tongues on the score of their common possession of inflection. See Max Müller, *Lectures on the Science of Language* (2 vols. Lond. 1862-64); Sayce, *Principles of Comparative Philology* (Lond. 1874); and Vámbéry, *Etymologisches Wörterbuch der Turko-Tatarischen Sprachen* (Leip. and Lond. 1878).

Tur'bary is a Common (q. v.) of English law, by which one person may have the right to cut turf from the ground of another. The right is usually constituted by prescription.

Tur'berville, George, an English poet, was born at Whitchurch in Dorsetshire about 1530, educated at Winchester and New College, Oxford, became secretary to Sir Thomas Randolph, ambassador at the court of Russia, and died about 1600. T. executed in 1567 two translations from Latin, *The Heroical Epistles of Ovid* (six into blank verse, and the rest into four-lined stanzas), and the *Eclogues of Mantuan*, an Italian poet who died in 1516. In 1570 he published *Epitaphes, Epigrams, Songs, and Sonets; with a Discourse of the Friendly Affections of Tymetes to Pindara, his Ladie*, which has given him a little niche among the Elizabethans. In addition, T. wrote books on *Falconrie* and *Hunting*, and among other things Englished *Ten Tragical Tales out of sundrie Italians, with the Argument and L'Envoye to each Tale* (1576).

Turbin'idæ, a family of *Gasteropodous Mollusca*, represented by the 'top shells,' and having a pyramidal or top-shaped shell, with a horny or limy *operculum*. The typical genus *Turbo* has a turbinated shell with a rounded base. The whorls of the shell are convex, and the aperture is large and rounded.

Tur'bot (*Rhombus maximus*), a species of flat fishes or *Pleuronectidæ* (q. v.), in which the body is of rhomboidal shape, the dorsal fin very long, and the eyes borne as a rule on the left side of the body. Allied to the T. is the well-known Brill (q. v.). The T. may attain a very large size, specimens ranging from 50 lbs. to 90 or 100 lbs. weight being frequently obtained. The upper surface is brown, and bears a number of detached bony tubercles or granules. The chief English T.-fishery is off the S.-eastern coasts of England and in the North Sea. Off the Dogger Bank the T. is also plentiful. The American or Spotted T. (*Rhombus maculatus*), an esteemed table-fish, has its upper surface marked by blotches of rounded outline and dark-brown hue.

Tur'didæ and **Tur'dus**. See MERULIDÆ.

Turenne', Henri de la Tour d'Auvergne, Vicomte de, second son of Henri, Duc de Bouillon, and of Elizabeth, daughter of William I., Prince of Orange, was born at Sedan, 11th Sept. 1611. He was brought up in the Reformed faith. At the age of thirteen he went to learn the profession of arms under his uncles, the Princes Maurice and Henry of Nassau. Recalled (1630) to France by Richelieu, he was made colonel of a regiment, and first distinguished himself at the siege of La Motte in Lorraine. During the retreat of the French army from Mainz (1635), his courage, fortitude, and humanity were conspicuous. In the campaigns of 1637-38 T. captured Landrecies, Soire-le-Château, Maubeuge, Brisach, &c. During 1639-42 he served in Italy, chiefly under the Comte d'Harcourt, winning numerous small victories, and capturing Turin, Moncalvo, Ceva, Mondovi, and Coni. His military reputation was now established, and he received the title of Marshal of France. Towards the close of 1643 T. was sent to the Rhine, and entrusted with the command of the French troops. His achievements during the last five campaigns of the Thirty Years' War covered him with glory, and proved him to be a leader indomitable in spirit and inexhaustible in resource. He captured Philipsbourg and Mainz (September 1644), held in check his three opponents, Mercy, Gleen, and the Duke of Lorraine, saved Speyer and Baccarat, retook Kreuznach, overran during the winter Suabia and Franconia to the gates of Nürnberg and Wurzburg, won the battle of Nordlingen (3d August 1645) in spite of the obstinate rashness of the Duc d'Enghien; drove the Spaniards out of the electorate of Treves; by a rapid and skilful march through Westphalia and Hessen united himself with the Swedes, swept over Suabia and Franconia, invaded Bavaria, was on the point of totally overwhelming the Imperialists, when orders came to withdraw to the Rhine, and, finally (17th May 1648), utterly defeated Montecuculi and Melander at Sommerhausen, on the road to Augsburg. This victory, followed by that of Condé over the Spaniards at Lens, brought about the peace of Westphalia (24th October 1648), and closed the Thirty Years' War. Now followed the troubles of the Fronde (q.v.), in which T. at first took the side of the Frondeurs, and through the seductive influence of Mme. de Longueville was induced to enter into culpable negotiations with the Spaniards for an invasion of France. But after a defeat at Rethel (15th December 1650) he became ashamed of civil war, and returned to his allegiance to the Crown. Condé, meanwhile, had quarrelled with Mazarin, and become a Frondeur. The two greatest generals of the age were now opposed to each other; and the firmness, coolness, and scientific skill of T. proved more than sufficient to baffle and defeat the impetuous valour of his adversary. In 1652 the victories of Targeau (30th March), of Etampes (4th March), of the Faubourg St. Antoine (2d July), together with his later splendid strategy, placed the young king in possession of Paris (21st October). In 1653 he was in command on the north frontier, and frustrated all the attempts of Condé and the Spaniards to penetrate through Picardy; in 1654 he stormed the Spanish camp near Arras, and inflicted enormous loss on the enemy; and in 1658 forced Dunkirk to surrender, after destroying the Spanish army of relief. The fall of Dunkirk was followed by the capture of Bergues, Furnes, Dixmude, Oudenarde, Ypres, Comines, De Gramont, Ninove, &c. The treaty of the Pyrenees (7th November 1659) was the result of the brilliant successes of T. When war broke out between France and Holland in 1667, fortune still attended T. In less than four months he captured Charleroi, Ath, Tournai, Douai, Oudenarde, Lille, and Alost. In 1668 he formally abjured Protestantism after considerable reading and reflection—an act which still further advanced him in the favour of Louis. The war between France and Holland (1672-78) witnessed his last and greatest achievements. His defence of the Rhine with an inferior force, and his invasion of North Germany, were prodigies of military skill and daring; but his devastation of the Palatinate (1674), though done under express orders, has left a dark stain on his reputation. On the 27th of July 1675 he was killed by a cannon-ball at the battle of Salzbach. T. was buried at St. Denis amid a national mourning. As a general, T. has rarely been surpassed. Napoleon admired him without limit. His character as a man is still more admirable. He was modest, simple, truthful, and full of genuine kindliness to all beneath him, especially to his war-worn veterans, to whom he liberally gave of his private resources. We have two publications of T., which possess a very great interest. The first, a narrative of his campaigns from 1643 to 1659, was published by Ramsay in his *Histoire de T.* (Par. 1735); the second is *Lettres et Mémoires du Maréchal de T.* (Par. 1782), edited by the Comte de Grimoard. T.'s 'Life' has been written by Pauletti (Par. 1677), de Courtilz (Koln 1685), Ramsay (Par. 1735), Raguenet (Par. 1738; new ed. 1877).

Tur'génjev, also **Tourguenef, Ivan Sergeïtch**, the most famous of Russian novelists, was born at Orel 20th October (November 9th) 1818, his family being of an old Boyar stock which in the last and present centuries produced several men of note in politics and literature. T.'s youth was passed in the country; but between the years 1834 and 1838 he studied at the universities of Moscow and St. Petersburg, and then spent two years at Berlin studying German philosophy, and acquiring the cosmopolitan literary knowledge which distinguishes him even among his widely educated compatriots. After a short trial of state service in the Ministry of the Interior, he devoted himself entirely to literature. His first attempts, written under the influence of Pushkin and Lermontoff, attracted no attention, but his series of *Sketches from a Sportsman's Journal*, published in 1846 in Belinski's review *Sowremennik* (*The Cotemporary*), aroused the greatest interest. They were for the most part directed against the institution of serfdom, but, apart from this tendency, exhibited all the characteristics which his later works have more fully developed—minute realism, unique power of dramatic presentation along with a striking lack of dramatic construction, deep insight into character, and delicate humour, thrown into relief by the sombre pessimism which forms the unvarying ground-tone of every picture which the author presents. Strangely enough, the first collected edition of these sketches (1852) escaped censure, but an article on the lately-deceased dramatist Gogol, which T. published about the same time, led to his banishment for two years to his estate. Released at the intercession of the Heir-Apparent, the present Emperor, he at once went abroad, and afterwards lived by turns in France, Germany, and Russia, until in 1863 he settled at Baden-Baden, where he now resides along with the Garcia-Viardot family. T. may be called a prolific novelist, though all his tales are short, none extending beyond a single volume, and some even of the most remarkable occupying only a few pages. The following is a list of his longer works:—*Rudin* (1855), *Helene*, *A Nest of Nobles* (1858), *Fathers and Sons* (1861), *Smoke* (1867), *An Unfortunate* (1868), *Spring Torrents*, *Virgin Soil*

(1876). Of his shorter stories, the following are among the most notable:—*Three Portraits* (1846), *Mumu* (1852), *A Correspondence* (1854), *Assja* (1857), *Apparitions* (1863), *The Adventure of Lieutenant Jergunoff* (1867), *The Jew, The Dog, Petouchkoff, The Brigadier, A King Lear of the Steppes, Punin and Balburin, Three Meetings, Faust, &c.* Most of his works have been translated into German and French, some of them being written in French by the author himself. The following have appeared in English:—The *Sketches from a Sportsman's Journal*, under the title of *Russian Life in the Interior*, translated from a bad French translation by Meiklejohn (Edinb. 1855); *Fathers and Sons*, translated by E. Schuyler (New York 1867); *Smoke* in a miserable translation, against which T. has protested, under the title of *Life at Baden-Baden* (Lond. 1868), and in an improved form (New York 1872); *A Nest of Nobles*, translated by Ralston under the title of *Liza* (Lond. 1869); *Helene*, translated by C. E. Turner, under the title of *On the Eve* (Lond. 1871); *Spring Floods*, translated by Mrs. Butts (New York 1874); and *Virgin Soil*, translated by T. S. Perry (New York 1877), and by Ashton Dilke (Lond. 1878). For biography and criticism, see *Der Salon*, vol. iii. (Leipzig 1869), Otto Glagau's *Die Russische Literatur u. Iwan T.* (Berl. 1872), *Scribner's Magazine* for June 1877, and Henry James, jr.'s, *French Poets and Novelists* (Lond. 1878).

Tur'got, Anne Robert Jacques, Baron de L'Aulne, a distinguished French economist and statesman, was born of a noble family at Paris, 10th May 1727. He was destined for the Church, and studied at various theological seminaries, and finally at the Sorbonne. Whilst a student here he wrote his first work on economics, *Lettre à l'Abbé de Cicé sur le Papier Monnaie* (7th April 1745). This treatise proved in a masterly manner, as against the economic fallacies of his time, 'that credit does not create capital, but only facilitates circulation.' In 1751 after ripe reflection he abandoned the clerical profession and entered the public service. In 1761 he was appointed Intendant of Limoges. During this interval of ten years (1751-61) he published the following works, *Lettres de Mme. de Grafigny* (1751), in which he criticised the pedantic system of education then in vogue, *Lettres sur la Tolerance* (1753), a noble plea in favour of religious liberty, *Valeurs et Monnaies* (1758), and shortly afterwards *Reflexions sur la Formation et la Distribution des Richesses*, in which he partially anticipated the riper speculations of Adam Smith. During this period also he enjoyed the intimate friendship of Quesnay and Vincent de Gournay, the eminent economists, and gradually matured his views on political and social subjects. The Limoges appointment gave him the opportunity of putting them into practice. He held the office for thirteen years, and during that time fought all sorts of abuses. He equalised and reduced taxation, removed imposts injurious to trade, and commuted *corvées*. His wise and liberal action reduced the burden of a terrible famine that desolated the country. He improved and encouraged agriculture. At last a wider field of usefulness was opened to him. On 20th July 1774 he was appointed Minister of Marine, and the same year placed over the department of finance. He had formed a vast scheme of financial, commercial, and political reform, and this he proceeded to put into execution. He restored free trade in corn and wine within France; he suppresed *corvées* and abolished *jurandes* or guilds; he reformed the finances; he encouraged the higher education and literature, and all in less than two years. But the vested interests of oppression and wrong, unjust exemption and unjust privileges, were too powerful to fall before the attacks of one man. As the result of a succession of intrigues he was dismissed from office (13th May 1776). The rest of his life was given to literature and science. He died 21st March 1781. The record of T.'s labours may be given in a Virgilian line, 'If Troy could have been defended, it would have been defended by this right hand.' Plans of reform like his were the only hope of salvation for France. If it had been possible to carry them out, the blessings of the Revolution might have been attained without its horrors. Personally T. was a man of a singularly pure and elevated character. His views were not merely in advance of his time, but in some respects of our own. He believed in free trade, 'even if other nations should set their ports against us.' He was an ardent advocate of freedom of thought and speech. Amidst infidels, hypocrites, and fanatics he alone preached and practised the maxims of a liberal piety. It is said of him that he leaped from the cradle to manhood, so precocious was his intellect. He worked continually. He wrote on many subjects, and always well. Like his great countryman, he was without fear, and his name is without reproach. See T.'s *Œuvres Complètes* (9 vols. Par. 1808-11; 2 vols. 1844); Condorcet's *Vie de T.* (Lond. 1786); Tissot's *T.* (Par. 1862); Professor Hodgson, *Two Lectures on T.* (Lond. 1870); J. Morley in *Fortnightly Review* (1870 and 1871); *Westminster Review*, vol. xvi.; and Foncin, *Essai sur le Ministère de T.* (Par. 1876).

Tu'rin (Ital. *Torino*), a city of N. Italy, formerly the capital of Piedmont and residence of the Dukes of Savoy, on the Po, which immediately below receives the Dora Riparia, 95 miles N.W. of Genoa by rail. Situated on an extensive plain, bounded W. by the Gratian and Cottian Alps, it is conspicuous among European cities for the regularity of its construction, its plan presenting an uninterrupted series of rectangular blocks and houses (*Isole*), and of long, broad, straight streets (formerly called *Contrade*, now *Vie*), interspersed with wide squares and delightful gardens. This notable symmetry is due to the circumstance that the plan of *Colonia Julia*, founded by Augustus, was carefully preserved in the extension of T., begun by the princes of Savoy in the 17th c. The fortifications raised by Francis I. in 1336 were partly cleared away during the siege of 1776, and later works were demolished by the French in 1801, while the citadel gave place to the railway in 1852. Opposite T., on the right side of the Po, which is here crossed by three bridges (one erected 1876-77), rises Monte dei Capuccini, 170 feet high, commanding a magnificent view The principal streets are the Via Roma, between the Piazzo Carlo Felice and Piazza Castello; the Via de Dora Grossa, between the Piazza Castello and Piazza della Statuto; and the Via di Po, going from the chief bridge, and built with arcades (*Portici*), which present a busy, brilliant appearance when lighted in the evening. Among the more important public works in recent years are the levelling of the Bastion Garden (*Giardino dei Ripari*); the conversion of the old Piazza d'Armi into building plots (1878), the transformation of the old Ghetto into an ornamental block of houses, and the construction of new river quays. T. is somewhat destitute of buildings of striking merit, as well as of antiquities. The Palazzo Madama, the lofty, cumbrous castle of the 13th c., is the only mediæval structure. Taking its present name from the mother of King Victor Amadeus II., who as Dowager-Duchess (*Madama Reale*) occupied and embellished the building, it was the seat of the Italian Senate till 1865, and now contains various institutions. The Palazzo Reale, a plain brick edifice of the 17th c., has a sumptuous interior, and a staircase adorned within recent years by statues by Vela and Varni. The Galleria Beaumont, or left wing, contains the Royal Armoury, one of the finest selections in Europe. Other buildings are the Palazzo Carignano (1680); the Italian Chamber of Deputies (1860-65); the Academia delle Scienze, containing a gallery of 514 pictures, and rich museums of natural history and antiquities (Egyptian); the cathedral of S. Giovanni Battista, rebuilt 1492-98, and containing tombs of the Dukes of Savoy; the richly-decorated Corpus Domini, restored in 1753; the Palazzo di Cetta (1659), with a portico adorned with statues, including one of Victor Emmanuele (1860); the Pinacotica, a royal picture-gallery recently formed, but containing among other treasures a valuable Memling; the Royal Library, with 50,000 vols. and 2000 MSS.; the Museo-Civico, with ethnological, prehistoric, and art collections; the large dome-church of Gran Madre di Dio (1818), in imitation of the Pantheon at Rome; and the Synagogue, the loftiest building in T., with a singular columnar façade, erected by Antonelli in 1863. The Superga (1718-31), now the burial-church of the House of Savoy, stands on a hill 2555 feet high, to the E. of T., and adjoining it are a seminary for priests and a trattoria. The university, founded in 1404, had, in 1875, 74 professors and 1292 students, and possesses a library of 225,000 vols., many valuable MSS. from Rabbis, and rare editions (Aldi). T. is peculiarly rich in statues, among the more notable of which are those of King Carlo Alberto and Emmanuele Philiberti, both by Marochetti: Brofferio, the poet and orator (erected 1871), d'Azeglio the patriot (1873), Cassini the jurist (1873), Cavour, by Dupré (1873), and Ferdinand of Genoa, by Balzico (1877). T. is a great centre of the N. Italian trade, and has, besides small industries in metal and wood, im-

portant manufactures of machinery and tools, tobacco, woollens, silks, cottons, leather, chemicals, gloves, Italian pastes, musical instruments, baskets, hats, and stearine candles. A single match factory employs 627 hands (470 females), and produces 7 million wooden and 4 million wax matches a day. A specialty is rabbit-breeding, begun only in 1873, already assuming great importance as a means of supplying the food market and the fur trade. T. has street tramways and is well lighted with gas. Pop. (1878) 227,843. T., originally a town of the Taurini, a Ligurian tribe, was sacked by Hannibal, B.C. 218, but became a Roman colony, B.C. 166, and was called *Augusta Taurinorum* by Augustus. It fell to the Lombards in A.D. 570, and by Karl the Great was made the residence of the Markgrafs of Susa, on the expiry of whose line it passed to the House of Savoy in 1060. It was taken by the French in 1506, and held till 1562; again taken in 1640 and in 1798, and on the last occasion held till 25th May 1799, when it was recovered by Suvoroi. After the battle of Marengo (1800) the French once more seized T., which remained in their hands till the Peace of Paris restored it to Sardinia in 1814. Long the centre of the national struggle for unity, it was the capital of Italy from 1859 till 1865, when it was superseded by Florence. See Cibrario's *Storia de Torino* (Tur. 1846).

Turkestan' (properly *Turkistan*, 'land of the Turks), the name of a wide, longitudinal, depressed region in Central Asia, which comprises the basins of the Amu-Darya (q. v.) and the Tarim (q. v.). It is separated on the S. by the Kuen-Lun from Tibet, by the Karakorum (Mustagh) and Hindu Kush from India and Ladak, the latter chain continuing W. in the mountains of Afghanistan and Persia. In the N. it is separated from Zungaria (q. v.) and the Russian province of Semipolatinsk by the Thian-Shan mountains. Divided by the Pamir Plateau (q. v.), or 'roof of the world,' into two distinct portions, T. has a total estimated area of 1,576,400 sq. miles. Eastern T. shades off into the Desert of Gobi, while Western T., sinking to the level of the Kirghis Steppes, extends to the shores of the Caspian. These two regions have a very dissimilar character, the latter containing the Iranian Khanates, now mainly embraced in the Russian Empire, the former from olden times, as now, the arena of Turkish adventurers, who have more or less successfully asserted their dominion against the Chinese Empire. Within *Western* T. are comprised the Russian government-general of T., the tributary khanates of Bokhara and Khiva, the Turcoman steppes, and the independent hill-districts of Karategin on the upper Oxus. The country is nearly synonymous with the basin of the Amu-Darya, and Russia holds both the right bank of the river in what used to be Khivan territory, and its delta, green with rice-fields. Not only is Khiva bound to receive traders from no other country than Russia, but ever since that power occupied Samarcand it has commanded the waters of the Zar-afshan, on which part of Bokhara (and especially its capital) depends for existence. The Amu valley and delta are covered with a grey clay, impermeable to water, and therefore invaluable to the inhabitants for the construction of canal-banks. The non-irrigated and far greater part of Western T., with the exception of a few table-lands, is covered with black or yellow sands (see KARA-KUM and KIZIL-KUM), and the only land fit for cultivation, in addition to the oases along the river, are the slopes of the hills. Khiva is the principal of the oases, and the Amu-Darya, at its greatest height in July, overflows the desert in the direction of the Caspian for 50 miles. By November 1874 the Russians had finished works at Khojend which were capable of irrigating 43,200 hectares. The climate is one of extremes, and the heat of autumn is aggravated by a wind laden with fine dust which is almost suffocating, and darkens the air for a week at a time. There is as yet little mining, although the Russian flotilla on the Aral draws supplies from the rich coal-deposits on the Sir-Darya, while the Thian-Shan and its spurs are particularly rich in iron, lead, rock-salt, and naphtha. Gold is found in the Obi district, and in the Karatan mountains are extensive coal-deposits, besides valuable ores. Wheat and clover are the winter crops; all other cereals, such as maize, millet, barley, rice, and pease, are sown in April and gathered in August. Grapes are cheaper than potatoes, and yield a good wine. Bokhara cotton is of excellent quality, and some 2,000,000 cwts. are despatched to Nijni-Novgorod, where 36 lbs. are sold at from 12 to 20 roubles. Tobacco and silk are also largely produced; some tobacco-seed from Maryland is succeeding admirably. Since the incorporation (1868) of T. with the Russian toll-dominion, trade statistics are wanting, but in 1867 the total Russian traffic with the country S. of the Kirghiz toll-line was valued at 29,300,000 roubles. Trade will receive a fresh impulse from the establishment of the railway from Orenburg, the survey for which was completed in December 1878. On a basis of a census of families the pop. is estimated at 4,000,000 Russian subjects, including Khokand; and 3,600,000 inhabitants of Bokhara, Khiva, Karategin, and the steppes. The chief races are Usbegs (q. v.), who are purely Turkish; Tajiks, the Iranian and trading people; the predatory Turcomans, Turks with an Iranian infusion, and the nomad Kirghis and Kara-Kalpacks. The prevalent language is akin to Turkish. *Eastern* T. is called *Nan-ly* by the Chinese, *Altai-shar* ('six towns') by adjoining Mohammedans, and *Iiti-shar* ('seven towns') by its Moslem rulers. It may be considered as identical with Kashgar (q. v.). Till 1853, Eastern T. was a Chinese province, but that year witnessed a massacre by the natives of the Chinese who rejected Islam, and subsequently it was ruled by its despot liberator, Yakoob Beg (q. v.), till his death in 1877. He was succeeded by his son, but the Chinese Government recovered its lost territory in 1879. See MacGahan's *Campaigning on the Oxus* (Lond. 1874); Hellwald's *Russians in Central Asia* (Lond. 1874); Schuyler's *T.* (6th ed. Lond. 1877); and Prejevalsky's *Through T. to the Lob-nor* (Lond. 1879).

Turk'ey (*Meleagris*), a genus of Rasorial birds, allied to the common fowl on the one hand, and to the pheasant and peacock on the other. The bill is strong, arched at its tip, and keeled. The nostrils are in a groove of the bill, and the wings, which are short, have their fifth and sixth quills longest. The tail is broad and rounded, and the tarsi are stoutly built, scaled in front, whilst they are also spurred. The front toes are united at the base. The head and neck are bare and provided with *wattles*. America is the native country of the T., the wild T. being found abundantly in certain districts of the United States. The Common T. (*Meleagris gallopavo*) is too well known to require any detailed description. It appears to have been first introduced into Europe at the beginning of the 16th c. The plumage of the wild male T. is a golden bronze, shot with violet and green, and banded with black. Its average length is 4 feet. The head is provided with wattles of bluish or purple colour, and a tuft of stiff black hairs protrudes from the breast. The Honduras T. (*M. ocellata*) is a different species from the true wild T., wanting the hairy tuft on the breast, and smaller than the common T. The back is of a bronze-green colour varied with gold, and the primary wing-feathers are black, edged with white. whilst the tail feathers are 'eyed.' The wattles and fleshy protuberance depending from the bill are orange-hued. The wild T. begins in October to migrate southwards to the Ohio and Mississippi.

Turkey-Buzz'ard. See VULTURE.

Turkey-Red' is the most brilliant and unalterable of all dyes applied to cotton or other vegetable fibres. The art of producing the colour is supposed to have been known in India from very remote times. In 1747 several Greek dyers were brought by a French firm to Rouen, and on account of its source the colour then came to be known as Adrianople Red, or T.-R. The art was not introduced into Great Britain till about 1783, in which year an enterprising manufacturer, David Dale, and an eminent practical chemist, Charles Macintosh, engaged a French dyer, M. Papillon, and laid the foundation of the great T.-R. industry which now flourishes in and near Glasgow. Papillon at a later period transferred his services to Lancashire. The industry is now also extensively prosecuted in Switzerland, Elsass, and various other German centres. The dye was originally applied to yarn alone, but since 1810 it has been the practice to dye piece-goods also. The material to be dyed—well bleached and washed—is treated with an emulsion of Gallipoli (olive) oil, potash, and water, and thereafter exposed to the air, or more generally hung in a heated stove for twenty-four hours. This operation is repeated several times according to the depth and intensity of the colour desired, and in the end the fatty material not fixed in the fibre is removed by steeping the cloth in a bath of carbonate of soda, and squeezing out the 'old white liquor,' as the fatty substance is termed. The goods are next 'sumached' with a solution of gall-nuts or sumach and alum, and they are then 'aged' by exposure in a hot stove for about three days. Thereafter they

are passed through a bath of hot water and chalk, and well washed, when they are ready for dyeing. Formerly madder was the dyeing material, but now artificial alizarine is almost exclusively employed, and produces magnificent effects. The pieces are kept in the dye beck in a solution at near boiling point for about three hours. Generally the processes from sumaching onwards are repeated a second time, and finally the dyed goods are cleared in three separate boilings, the first with soap, and the second and third with chloride of tin added to the soap solution. After drying, the operations are complete, the whole consuming about three weeks, although good effects may now be produced with fewer processes and less loss of time.

Turk'ish or **Ott'oman Em'pire** (Turk. *Osmanli-Vilayeti*), one of the largest and most populous states of the Old World, consisting of adjacent parts of South-eastern Europe, Western Asia, and Northern Africa. It occupies a remarkably central position, but its strength lies in Asia, where the Turk is supreme up to the Russian and Persian frontiers. In Africa, distance has co-operated with other causes in making Egypt and Tunis but loosely dependent on the Sultan's authority, but Tripoli and Barca are still actually Turkish pashalics. Important alterations have been effected in European Turkey by the provisions of the Treaty of Berlin (13th July 1878). The chief terms of the Treaty are (1) the erection of Bulgaria into an autonomous and Christian principality, tributary to the Sultan; (2) the formation of Eastern Rumelia as a semi-independent Christian province (see RUMILI); (3) the complete liberation of Servia, Rumania, and Montenegro from Turkish allegiance; (4) the occupation and administration of Bosnia and Herzegovina by Austro-Hungary; and (5) the recommendation by the Powers of a rectification of the Greek frontier, and an offer to mediate if necessary. Large territorial cessions have accompanied these political changes, the aggregate amount of area detached in European Turkey alone being 70,617 sq. miles, and carrying with it 4,425,000 inhabitants. Not to mention the retrocession of part of Bessarabia by Russia (see RUMANIA), other important changes are the cession of the Armenian districts (Ardahan, Kars, and Batoum) to Russia in accordance with the Treaty, and the occupation of Cyprus (area, 2288 sq. miles; pop. 150,000) by England in terms of the Anglo-Turkish Convention of 9th June 1878. Prior to these changes, European Turkey, exclusive of Rumania, had an area of 142,751 sq. miles, and a pop. of 9,700,000. The area and population of 'consolidated' Turkey are as follows, according to the *Almanach de Gotha* for 1879:—

	Area in sq. miles.	Pop. 1879.
Turkey in Europe	72,134	5,275,000
" Asia	729,684	17,536,465
" Africa—		
Egypt and Dependencies . . .	869,378	17,400,000
Tripoli	344,430	1,010,000
Tunis	45,715	2,100,000
Total	2,061,341	43,321,465

Reckoning as still part of Turkish territory the provinces of Bulgaria and Eastern Rumelia and those presently occupied by Austria, the European portion has an area of 140,965 sq. miles and a pop. of 8,971,000. By the San Stefano Treaty, Turkey was called upon to surrender 78,550 sq. miles and 4,539,000 inhabitants—a demand relatively greater than that of the Berlin Treaty. According to the former, Bulgaria was made to extend from the Danube to the Ægean (65,560 sq. miles; pop. 3,986,000), while the latter drew the boundary at the Balkans. The territory which passed out of the possession of Turkey is shown in detail in the following table:—

	Sq. miles.	Population.	Mohammedans.
Ceded to Rumania	5,935	246,000	142,000
" Russia	5,265	127,000	...
" Servia	4,284	367,000	75,000
" Montenegro . . .	1.976	116,000	9,000
Formed into the Principality of Bulgaria	24,659	1,859,000	681,500
" Province of Eastern Rumelia	13,664	751,000	265,000
To be administered by Austria	20,117	1,086,000	513,000

The portion of Turkey governed directly is divided for administrative purposes into *vilayets* or governments, into *sandjaks* or districts, and into two still smaller subdivisions. *European Turkey* comprised, prior to the Berlin Treaty, nearly the whole Balkan peninsula, extending from the frontier of Russia and Hungary to that of Greece. It is now practically bounded N. by the Balkans, and its northern boundary-line is continued along the frontier of Servia and Montenegro, the provinces of Bosnia and Herzegovina which form an outlying portion in the N.W. being separated from the Adriatic by the coast-strip of Dalmatia. It is now divided into the vilayets of Constantinople, Adrianople, Gallipoli, Saloniki, Janina, Bitolia (Monastir), and Scutari. The Island of Crete (q. v.) forms a separate vilayet, and among the islands that fall under European jurisdiction are Samothrace, Imbros, and Lemnos, near the Dardanelles. *Asiatic Turkey* comprises Asia Minor eastward to the Persian frontier, and to the S., Mesopotamia, Syria, the whole Red Sea coast of Arabia, and the northern half of the Arabian coast on the Persian Gulf. Besides the nine vilayets forming Anatolia, the vilayets into which Asiatic Turkey is divided are Erzerum, Diarbekr, Bagdad, Aleppo, Syria, Hedjas, Yemen, and Hedjen. The Ægean coast has a fringe of islands, of which the principal are Rhodes, Cos, Patmos, Chios, Mitylene, and Tenedos. (For the geography see ANATOLIA, SYRIA, PALESTINE, ARABIA, &c., and articles on the various physical features, as TIGRIS, EUPHRATES, LAKE VAN, LEBANON, &c.). The only very considerable town in Turkey is Constantinople (q. v.), the capital of the empire.

Physical Aspect.—European Turkey is for the most part mountainous, but with richly varied scenery; its fertility is boundless, and its climate, as a whole, is genial and healthy. Limited in area, it still embraces some of the fairest parts of Europe. Alpine continuations run along the Dalmatian land-frontier, where they are called the Dinaric Alps, and further S. they spread out over the whole Greek peninsula in multitudinous ridges. The best defined of all the ranges is the Balkan (q. v.), which, running E. and W., separates the basin of the lower Danube from the country draining to the Archipelago, and terminates on the Black Sea in a bold promontory. At Rilo-Dagh, which has a height of 9842 feet, the Balkan sends off the Despoto-Dagh in a southerly direction to the Archipelago, parting the basins of the Struma and Maritza. Further W., the main southerly continuation of the Dinaric Alps, the Pindus range traverses Albania, attaining in the N. in Tchar-Dagh its greatest height of 9700 feet. Near the Greek frontier Pindus sends off a branch towards the Gulf of Saloniki, and this branch terminates in the Olympus of Greek poetry. The Tchar-Dagh is the central point in the configuration as the source of streams flowing in different directions, the Morava to the Danube, the Vardar to the Archipelago, and the Drin to the Adriatic. The Balkan owes much importance to its position as a defence of Constantinople, and it is crossed by three principal passes from Bulgaria,—the one from Sophia to Philippopolis on the upper Maritza, called Trajan's Gate; the second, leading down the Tunja to Adrianople, and guarded by the fortress of Shumla; the third, the Shipka Pass, between Kesanlik and Kabrova on the way from Tirnova. In this mountainous country plains are not wanting, the largest being the basin of the Salambria in Thessaly, the joint basins of the Vardar and Struma in Macedonia, and the drainage area of the Maritza in Thrace. These are insignificant compared with the plain of the lower Danube, and its northern affluents the Sereth and Pruth. Excepting the Danube, the rivers of the peninsula are practically useless for navigation, being of the nature of torrents. The largest, the Maritza, admits rafts as far as Adrianople, but only in winter. Amid the rugged fastnesses of Albania (the native *Skiperi*, or 'land of rocks') are numerous mountain-lakes, adding their charm to the magnificent scenery. The chief of these lakes, which drain into the Adriatic, are Scutari, with its affluents the Bayana, the Ochrida, drained by the Drin and the Janina, at the S. end of which is believed to have stood Dodona, the seat of the most famous oracle of Zeus.

Climate, Geology, and Products.—In European Turkey the general healthiness of the climate contrasts strongly with the pestilential state of the lower Danube during summer. Only near the fetid sea-marshes scattered at intervals along the shore is fever prevalent, but disease finds a powerful ally in the sanitary neglect universal in the larger towns. High up the mountains the winter is singularly severe, the higher summits bearing perpetual snow. But where the land declines towards the

Archipelago on the Adriatic the climate is, generally speaking, that of southern Europe—mild winters alternating with hot summers. Earthquakes are not unfrequent in Albania, where Secondary rocks predominate (chiefly crystalline slate). In the S.W. of Albania, and also in the basin of the Maritza, the formation is Tertiary. The Balkan is mainly Cretaceous, and contains at least one track of Upper Palæozoic, a small portion of which also appears to the N.W. of Constantinople. Hot springs are numerous. The crystalline schists are richly metalliferous, but there is almost no mining industry. Iron, lead, and copper abound, and among other minerals present are gold, silver, coal, sulphur, salt, alum, and marble. The pine, beech, ash, and oak, which cover great portions of Bulgaria and Rumania, are confined in the S. to the mountain-sides, which they clothe to high elevations. The oak yields for export galls and *valonia* (*i.e.*, acorn-cups), invaluable for tanning. On the lower mountain-slopes grow walnuts, mulberries, planes, maples, carobs, almonds, sycamores, &c. The fruits include the apple, pear, cherry, plum, apricot, peach, citron, olive, and vine. To the S. of the 40th parallel the commonest fruit-tree is the olive, while tobacco, silk, and cotton are staples. From the plum is manufactured the *raki*, or common spirit of the country. The soil is very fertile, but only a comparatively small portion of the area is under culture. Besides wheat, barley, and rye, the crops include buckwheat, maize, rice, hemp, flax, saffron, aniseseed, cummin, and liquorice. The S. base of the Balkan is remarkable for the culture of roses for the manufacture of the costly attar. Throughout Turkey the peasantry give much attention to live-stock, and cattle, horses, sheep, and swine are among the commonest articles of trade.

Industries, Customs, and Classes.—While the Bulgarians, sober, diligent, and slow of speech, find their sole interest in agriculture, the Greeks, enterprising in the cultivation of any special kind of produce, are versatile and ubiquitous, and in all vocations they exhibit energy, perseverance, and address. The Albanians, in addition to agriculture, are employed in making a stout woollen felt for the *capa* or cloak, a kind of red leather, and home-spun tissues used for the rich embroideries of the national costume. Their social relations are limited to two ideas, namely, *bessa* ('peace') and the implacable *vendetta*. 'An Albanian's gun is his companion and his means of subsistence in peace and war.' The penniless *chiplak*, when he takes to brigandage, retains the qualities of bravery and gratitude, and accounts it dishonourable or unlucky to attack women. The Turkish peasant is industrious, ignorant, and submissive, and the more regular enforcement of the conscription has developed his proneness to apathy and improvidence. The tradespeople of the towns are ranged in *ensafs* or guilds, and some of these corporations admit Christians of the same occupations, but the prosperity of the Christian excites a bitter feeling among his Turkish neighbours. Commercial enterprise is almost unknown among the wealthier Turks, and this is due in part to individual lethargy, in part to the attitude of the Government, which has never shown readiness to aid private undertakings, or to offer the guarantee of disinterested protection. The Government now professes to share the anti-slavery ideas of England, but on female slavery is based the system of the harem and seraglio. According to the patriarchal custom, the slaves are considered part of the household; Circassians are often advanced to the dignity of wives. Abyssinians are the most capable, and negroes the most numerous. A slave is entitled to her liberty after seven years of bondage, and the condition is usually observed, and she is then dowered and married to a freeman. Polygamy is practised agreeably to the Koran, and the Asiatic element appears markedly in the domestic arrangements, in spite of the recent adoption of European customs and fashions and the enforcement of a modified Frankish dress upon Government servants. The women are secluded in the *haremlik*, and their education is limited to frivolous accomplishments and the arts of the coquette. A real *Hanoum* or Turkish lady is dignified, elegant, sensible, and often naturally eloquent, although not gifted with great conversational resources. The bath is an appendage of even the poorest house, and some of the public baths are often fine buildings.

Land Tenure.—Land is of three kinds: *mevkoufé* (or *vakouf*), 'church' property; *mirié*, crown property; and *mulk* or *memlouké*, freehold. The first is land set aside for the support of religious establishments, the mosques, *medresses* or mosque colleges, other religious schools, and *imarets* for almsgiving. On the conquest, a large share of land was held 'for God,' and this has been greatly augmented by private munificence. But such land is acquired from a third source. Being held direct of Allah it is free of taxation, and a proprietor by selling his land to a mosque, for say a tenth of its value, and retaining the right of lease, not only gets rid of all taxes, but is safe from confiscation by government, extortion from its officials, and persecution from private creditors. He may sell the lease, or at his death it passes to his heirs, but in default of direct heirs the lease reverts to the mosque. So avaricious are the mosque authorities that they willingly contract with Christians. These lands are estimated at two-thirds of all of Turkey (see RELIGION). The *mirié* include the private demesnes of the Sultan, lands reserved for the partial support of the administration, and the waste lands. They formerly included till the time of Mahmoud II. an enormous area granted by the Sultan on condition of military service. Great abuses are occasioned by the corruption of the *Tapou Memours* or *mirié* inspectors, appointed in 1871. The *memlouké* or freehold lands are very limited, a prejudice existing against this form of tenure on account of the difficulties of establishing titles. The division of property among all the children, and the reduction of its value by succession duties, tend to the deterioration of Turkish estates, and lead generally to mortgage at an average interest of 18 per cent. Large estates can be purchased for small sums, and wealthy native Christians would gladly become purchasers but for the risks of insecure tenure and agrarian violence. Foreign subjects now hold land on the same conditions as the subjects of the Porte, and they are greatly more respected than native Christians. Some English gentlemen possessing farms in Macedonia had no cause of complaint even during the anarchy of 1877.

Commerce and Public Works.—No official returns of the trade are published, but the exports of the empire, excluding Egypt and Rumania, has been estimated at £10,000,000, and the imports at £18,500,000. The imports are almost entirely manufactured goods, and the exports include grain, tobacco, wool, silks, carpets, morocco leather, opium, meerschaum, attar of roses, cotton (since 1860), drugs, dye-stuffs, spices, and fruits. The exports from Great Britain in the year ending 31st December 1878 to European Turkey amounted to £4,167,232, and to Asiatic Turkey, including Cyprus, to £3,591,778. In 1877 the corn exports to Britain alone amounted to £2,641,226. The chief ports after Constantinople are Smyrna, Beyrout, Saloniki, Volo, and Adana. In 1877 there entered at all the ports 205,626 vessels of 19,621,611 tons (226,540 vessels of 18,855,488 tons in 1876). In 1877 the Turkish mercantile marine had a total tonnage of 181,500, including 226 deep-sea vessels of 345,000 tons, and 11 steamers of 3350 tons. The great obstacles to trade are the want of internal communications, the maladministration of the customs, and the ignorance and peculation of officials. (See *Report of the Incorporated Chamber of Commerce of Liverpool*, 1879.) In 1877, besides the railway from Constantinople to Sophia, with its two branches, Turkey had a line from Saloniki to Mitrovitza, and when extended this line will connect Macedonia with Austro-Hungary. The total length of railway open in 1878 was 786 miles. There are also lines from Smyrna to Aidin (145 miles), and from Ismid to Scutari (27 miles). An important item in the scheme of reform in Asiatic Turkey is the project of a Euphrates Valley Railway.

Government and Administration.—The government is known in history as a despotism, tempered by the ecclesiastical authority of the Sheik-ul-Islam, chief of the Ulema, whose *fetva* or sentence, in reality the foregone conclusion of the nation or a dominant faction, passes for the will of God, and has availed even to the deposition of the Sultan. By way of answer to the remonstrances of Europe, a constitution on the French model was established, 23d December 1876. The Sultan or Padishah is declared irresponsible, but retains many of the chief functions of the State. The Grand Vizier is now called President of the Council of State; the Sheik-ul-Islam, or Grand Mufti, who represents the spiritual power of the Khalifat directly, is supreme judge. During 1878 there were six changes of ministry. The Ulema, the learned and rigid expounders of the Koran, have gained great ascendancy in public affairs. They are powerful advocates of 'reform,' but the reforms they demand are those of the ancient Osmanlis, and the execution of the Sheriat or Koran laws. The governors-general of vilayets

are called *Valis*; large districts are under *Mutessarifs*, or sub-governors. *Mudirs* are governors of villages, the inferior officials of which are *mukhtar*. These posts, formerly given to *Chibouk jes* (pipe-bearers), &c., are now filled by the sons of higher-class Turks trained at the *Kalem* or Chancellerie d'État. But the vast body of officials are as yet ignorant and unscrupulous. The municipal administration exaggerates, if possible, all the defects of Imperial rule. The sanitary laws were recently reorganised, and a district police corps was formed at an expense that might have ensured efficiency; but the towns are as neglected as ever; the ill-paved streets, badly lit with petroleum, are a receptacle for refuse. The country, since the war, is once more under the terror of brigandage. Robbery and violence are, however, the natural fruits of favouritism and bribery.

Finance, Army, and Navy.—The finances of T. are in a state of hopeless confusion, and the official budget is quite unreliable. The budget for 1877-78 gave the revenue at £17,752,810, and the expenditure at £28,578,640, leaving a deficit of £10,825,830, but the deficit for the year is estimated at not more than £4,250,214 by the *Bulletin de Statistique*. The floating debt amounts to £28,779,227. The supplementary budget to cover the war expenses is £14,609,506, and to meet this a new obligatory loan of £5,000,000 has been decreed in the interior, bearing 10 per cent. interest, the tax on sheep increased from £1,590,300 in 1876 to £2,925,000, and a foreign loan contracted with the holders of the bonds of 1854, 1855, and 1871, for a sum equal to and secured by the Egyptian tribute (£280,000). Gold is scarce, and the issue of paper-money (caimés) is enormous—£19,000,000 at the end of October 1878. At the beginning of 1878 the total general debt might be estimated at £245,200,000, comprising the consolidated debt, £200,000,000; applied arrears, £25,600,000; floating debt to bankers, speculators, &c., and paper-money, £19,600,000. By a law of 1869 military service is obligatory for all Mohammedans. The service is for twenty years, of which four (in the cavalry five) are in the active army (*Nizam*), two on leave (*Ikhtyat*), six in the landwehr (*Rédif*), and ten in the landsturm (*Mustahfiz*). The non-Mohammedans are exempted from service, and must pay a *Bedel-i-askeriyèh* of from £27 to £45 a-head; they are obliged, however, to serve in the fleet when called. The reorganised forces were 730,000 men till the end of 1878, and then the active army was reduced to 220,000 men. The artillery in the active army consists of 103 batteries with 618 guns. A considerable proportion of the better-class Turks belong to the army, but there is little chance of promotion on the mere strength of ability. The training of the new military schools is below the European standard. In 1878 the navy comprised 15 ironclads, 18 smaller ironclads (including 11 monitors), and 40 steamers. Vast sums have been lavished on ironclads, mostly of English make, but neither commanders nor crews seem expert in naval tactics.

Religion and Education.—According to E. G. Ravenstein (*Journal of Statistical Society*, September 1877), there were in European Turkey 4,247,000 Mohammedans, in Asiatic Turkey 12,273,350. In the former there were 4,705,450 orthodox Christians, 426,000 Latins, 89,000 Armenians, &c. The religion of the Turks is properly the orthodox or *Sunni* form of Islam, and the church is governed by the Ulema, or learned men trained in the mosques, between whom and the dervishes, who head the popular faith, there is the intensest rivalry. Softas, the supporters of the Ulema, may be called Mohammedan undergraduates. The Ulema order is divided into three classes; the *imams*, or ministers of religion; the *muftis*, or doctors of law; and the *kadis* or *mollahs*, judges. The first of these pronounce the prayers in the mosques and figure in social ceremonies; the second are barristers in the courts of justice; the kadis or judges are distinguished even in T. for avarice and venality. The enormous revenues of the vakouf or mosque lands, or what of the revenues are not embezzled, go to maintain the large class of Ulema. The Greek Church (q. v.) in T. is entangled to some extent with the Porte, but it is a sign of hopefulness that her ecclesiastics are finding their way to the colleges of Italy and Germany. The good resulting from the adoption of this creed by the Bulgarians has been sadly diminished by the long and bitter antagonism into which their Panslavism brought them with the Panhellenic Greeks. Only part of their grievance was amended by the substitution at a late date of a Bulgarian Exarch for a Greek Patriarch (see Lord Strangford's writings). Of recent years excellent religious books have been circulated by the Mechitarist College of Venice, and by the American missionary societies. These are specially acceptable to the Armenians. In Central T. alone there are now 26 organised Protestant churches, with some 2500 members. The present century has seen the introduction of Government schools. The international Lyceum at Constantinople was founded in 1868. Here the Bulgarians have always held the first rank; the Greeks, 'in addition to some good characters, have presented a great many bad ones.' (See *Revue des Deux Mondes*, October 15, 1874.) This result is in consonance with the more forward state of education in Bulgaria. There is now a celebrated Prussian school at Smyrna.

Ethnology.—The population of Turkey from the Adriatic to the Euphrates is singularly complex, distinctions of race being here intensified and there disguised by conditions of religion and language. Unlike the races of Western Europe, with their common Aryan descent and Christian faith, those of Turkey show no power of assimilation, but remain distinct as when they settled, unaffected by any predominating national type. 'We cannot conceive a Welsh, an English, and a Norman village side by side; but a Greek, a Bulgarian, and a Turkish village is a thing which may be seen in many parts of Thrace' (Freeman). The three races occupying the peninsula at the beginning of history are still there; the Greeks, distinguished by Greek speech and Orthodox faith; the Skipetar or Albanians, believed to represent the ancient Illyrians, and now intermingled with the Greeks, and the Vlacks and Rumans, in whom Freeman sees not the descendants of Trajan's Roman colonists, but Romanised Thracians. On these abiding races came, after the Roman Conquest, the Wandering of the Nations and the appearance of the Slavs, who in the time and manner of their coming answer roughly to the Teutons in Western Europe. The Slavs are undoubtedly the greatest elements in the peninsula, the Bulgarian Slavs prevailing in Macedonia as well as in Bulgaria, and the Servian Slavs prevailing not only in Servia but Herzegovina and Montenegro. In Western Europe the Turanian has repeatedly appeared, but only as a passing invader; his part was widely different in Eastern Europe. Avars, Patzinaks, Chazars, Cumans, and others, held temporary dominion, and three bodies of more abiding settlers, the Bulgarians, Magyars, and Mogul conquerors of Russia, entered from the N., while from the E. came a fourth, the Ottoman Turks. The Finnish Bulgarian has been absorbed among Slavonic subjects, and is a Slav bearing the Bulgarian name. But this is the only case of assimilation among the intruders. In the N., the geographical function of the Magyar has been to keep apart two great groups of Slavonic nations. The line of the Save and the Danube, so important in diplomacy, has no ethnological existence. In one part of Dacia the Teutonic element is represented in a pure form by the Saxon immigrants of Transylvania. The Turks, Osmanli, and Tartars constitute a majority of the population in only a few small districts, chiefly in Thrace and Eastern Bulgaria. They do not form a majority even of the Mohammedan population, which has been swelled by converts from all the subjugated races, except the Rumanians. Of the Christian races the Greeks are the cleverest, the Albanians the most heroic, and the Slavs the most peaceful and industrious. The permanence of Turkish rule has been in great part due to the disunion and jealousy of these races. The latest settlement in Turkey took place in 1864, when the Circassians, driven from home by Russian aggression, were allowed to spread over the Dobrudcha and Bulgaria. According to Ravenstein, the Turks in European Turkey in 1877 numbered 1,767,500, the Greeks 1,465,000, Albanians 1,920,000, Rumanians 189,200, Bulgarians 2,578,550, Servians 1,272,000, Russians and other Europeans 48,500, Armenians 112,200, Gypsies 104,750, Jews 78,800, Circassians 98,000, Arabs 27,500, Kurds 1000, and Lasis, &c. 1000. In Asiatic Turkey the Turks and Tartars numbered 6,983,500; the chief European race was the Greek (1,046,868).

History.—The generic name of Turk is now commonly given to the Ottoman, who in reality only represents one branch of the widely spread Turkish family (see TURKS). Care must be taken to distinguish the Ottomans from other Turkish dynasties, and also from the Saracens, with whom they first came into contact at the supremest period of the Khalifate (about 710), and from whom they took their religion. Much as the Franks set up 'a new Western Empire with its seat at the old Rome,' so the Turks, first the slaves and mercenaries of the Khalifs, ended by themselves claiming in the house of Othman the powers of

the Khalifate. The House of Seljuk (q. v.) and the Sultans of Roum or Rome (land taken from the Roman empire) had carried conquest to the shores of the Propontis before the Ottomans appear as unexpected allies of the latter against the Mongols. These Turks were seeking a settlement under their leader Ertoghrul, and for their aid they received a grant of lands. Othman (q. v.), or Osman, son of Ertoghrul, from whom is derived the national name of Osmanli or Ottoman, became the most powerful emir in Western Asia, and extended his dominion at the expense alike of Turks and Greeks. Just before his death (1326) his armies took Brusa, which became the Asiatic capital of the Ottomans. With Othman's son Orkhan the empire really begins, for he it was who threw off the allegiance to the Seljuk Sultan at Ikonion, extended the Ottoman rule over Anadol or Anatolia, the land of the East, and first made good a footing in Europe. To Orkhan is also due the institution of the tribute of children, on which was based the formidable force of the Janissaries (q. v.). The Ottomans had appeared in Europe as ravagers, as imperial mercenaries, and as allies of contending parties in the Empire, before they permanently occupied Kallipolis in 1356, but in the reign of Amurath (q. v.) they made swift advances. They formed Kallipolis into a compact power, hemmed in what was left of the Empire, and made Hadrianople their capital (1361). Servia had lost Stephen Dushan, and Bulgaria was then split into three kingdoms, and both powers were gradually dissolving, but Bosnia, which lay further from the Turks, was growing in strength, and a great Slav confederation under the Bosnian king Stephen resisted for a time the approach of the Eastern conquerors, only to be utterly crushed at Kossova in 1389. Amurath fell by the hand of an assassin, but Bajazet (q. v.) completed the conquest of most of Bulgaria, ravaged Bosnia, and made Servia and Wallachia tributary. Bajazet, the Thunderbolt, who exchanged the title of Emir for that of Sultan, was the first directly to attack Constantinople, but he had to turn aside in his own defence. Already had he overthrown a large army of crusaders under Sigismund of Hungary at Nicopolis (1396), and in turn he was defeated and taken captive by Timur at Angora in 1402. His possessions were disputed among his three sons, and the dispute ended in favour of Mohammed I., whose son Amurath II. (q. v.) wrested Thessalonica from the Venetians, and asserted the power of Turkish arms at Varna (1444) against Vladislaus and the great captain Hunnyades (q. v.). For Mohammed II. (q. v.), the Conqueror, was reserved the crowning triumphs of Ottoman power, the taking of the Imperial city and the overthrow of Greek nationality. 'We may take him,' says Freeman, 'as the ideal of his race, the embodiment in their fullest form of Ottoman greatness and Ottoman wickedness.' A general and statesman of the highest order, he prominently exhibits the peculiarly Ottoman vices of 'cruelty, lust, and faithlessness.' The annexation of Servia (1459) and Bosnia (1465), and the subjugation (1459) of Albania, long defended by Scanderbeg (q. v.), gave to European Turkey its well-known historical dimensions. The few islands or pieces of the coast that had escaped were held by Venice or other Frankish powers. Only the brave men of Zeta (see MONTENEGRO) and the city of Ragusa maintained their independence. In his last years Mohammed, having failed to take Rhodes from the Knights of St. John, suddenly seized Otranto, and but for his death the Ottoman power might have overshadowed Italy. Bajazet II., sensual and mystic, was deposed (1520) in favour of Selim I. (q. v.), the Inflexible, who added Syria and Egypt to the dominions, and to the secular title of Sultan the spiritual authority of the Khalifate. Selim outdid any previous Ottoman ruler in systematic bloodthirstiness, and was only hindered by the Mufti Djemali from a general massacre of the Christians. In the reign of Suleiman (q. v.) the Magnificent, the Lawgiver, the Ottomans were raised to their highest pitch of power and splendour; in it also began the decay of their military and moral supremacy. Suleiman took Rhodes and Belgrade (1521), and after the victory of Mohacz (1526) brought Transylvania into vassalage, laid siege to Vienna (1529), and transformed great part of Hungary into the pashalic of Buda. The Protestants of Hungary were certainly glad of the alliance, but only because of the fierce persecution of the bigoted Austrian kings. Wallachia and Moldavia were made tributary, while they retained the right of self-government, a system which lasted from 1536 to 1711, when the Sultans took to appointing as rulers Fanariot Greeks. Within Turkey the influence of the viziers, the pashas, and the women increased; the taxes were farmed out to Jews and Greeks, the soldiers fought less for victory than plunder. Luxury, idleness, avarice, and their kindred evils, followed in the train of conquest, and rendered this, in the opinion alike of Turkish and Christian writers, the period from which to date the decline of Ottoman power. The last of the line of great sultans was followed by Selim II., the Drunkard, whose short reign (1566–74) is marked by the first great Turkish reverse, the overthrow of the fleet at Lepanto (1571) by the fleets of Spain and Venice. The gain of Cyprus was far outbalanced by the loss of prestige which makes Lepanto a turning-point in Turkish history. From this period the names of sultans are but loosely associated by the European reader with the course of events. Among those distinguished by any peculiar quality, Amurath IV. (1623–40) stands forth as the most bloody, Ibrahim as the most brutally sensual of the line. Suleiman II. (1687–91) and Mustafa II. (1695–1703) were marked by some force of character. In the latter part of the 16th c., and most of the 17th c., the chief wars were with Venice, and with the Emperors as Kings of Hungary. Amurath III. was able to force the Poles, whose kingdom then stretched much further S.E. than ever before or after, to accept as king Stephen Bathori, Waiwode of Transylvania. In Hungary the Turk at first maintained his predominance, penetrating to within 40 miles of Vienna, but the great battle of St. Gothard (1664), in which Montecuculi defeated the Vizier Kiuprili, was the first of a long series of Christian victories. Notable also was the taking of Crete in 1669, after a siege begun in 1645, and the gallant defence of the town of Candia by the Venetians. Meanwhile the affairs of the Cossacks in the border-lands of the Crimea led to wars with Poland and Russia. In the Polish war (1672–76) Sobieski won several brilliant victories, and the Turks took the strong town of Kaminiec and the whole province of Podolia. This accession of territory, the last fresh conquest from a Christian power, was due to the ability of Kiuprili, the first of a family in which the office of Vizier was held at various times with singular power and tolerance. Kiuprili's successor, under Mohammed IV., Kara Mustafa, conducted the unsuccessful war with Russia, the first of any moment, in which he lost the superiority of the Ukraine. He undertook the complete conquest of Hungary, and again besieged Vienna (1683), but the city was saved by Sobieski, and by the end of the war (1698), in which both Sobieski and Eugene (q. v.) of Savoy won famous victories, Hungary was freed from the presence of the Turks. The Venetians had made good their chance to overrun the Peloponnesos, and Peter the Great had seized upon Azov, the key of the Euxine (1696). By the Peace of Carlowitz (1699), Mustafa II. surrendered not only Hungary (except the Banat of Temesvar, with Transylvania and part of Slavonia), but gave back Podolia to Poland and concluded a truce for twenty-five years. War with Russia broke out in 1711, and Turkey won back Azov, a success followed by the re-conquest of the Peloponnesos in 1715. The Turks proceeded to threaten Corfu and Dalmatia, but in 1716 the Emperor Karl VI. made an alliance with Venice, and the imperial armies under Prince Eugene subdued the remaining parts of Hungary and Slavonia, with Belgrade, and parts of Servia, Bosnia, and Wallachia, which were secured to the House of Austria by the Peace of Passarowitz (q. v.) in 1718. War again began on the part of Russia in 1735, and of Austria in 1737. The Russians made conquests which they failed to keep; the Emperor Karl, who had no longer a general like Eugene, was forced by the Peace of Belgrade (1739) to abandon all that had been won in Servia, Bosnia, and Wallachia. By the war waged in the last years of the Emperor Joseph II. various conquests were made, including Belgrade, but nearly all was given back by Leopold II. at the Peace of Sistova in 1791. Thus the last of the Austrian wars, which had gone on with breaks ever since the battle of Mohacz, ended in the freedom of Hungary being acknowledged, while Turkey was left in possession of Servia and Bosnia. With Catharine II. began the real advance of Russia. The first war of her reign began in 1768, and ended with the famous Treaty of Kainardji in 1774. Russia gained the disputed possession of Azov, and the Tartars of Crim were recognised as independent only to be incorporated by Russia in 1783. Moreover, Russia was acknowledged by the treaty as the protector of the Christian subjects of Turkey. By the Austro-Russian war of 1787–91, which ended in the Peace of Sistova, Russia advanced her frontier to the Dniester and obtained the famous fortress of Oczakov. Turkey was then in a state of

anarchy; the Sultan Selim III. was in the hands of the military chiefs, the leaders of the rebel Janissaries. Before the revolt of Servia began, the revolutionary French, under Bonaparte, attacked Egypt in 1798, and was only checked by a Turkish alliance with England and Russia. In 1805 Russia demanded a more distinct recognition of her protectorate over the Christians, but Selim, encouraged by Napoleon, resisted, and began to interfere, contrary to treaty, with the government of Rumania, thereby bringing on a war with England and Russia. Subsequently Napoleon and the Czar Alexander planned a partition of Turkey which came to nought; but the Russian war went on till 1812, when the Peace of Bucharest gave her Bessarabia (q. v.), with the Pruth as a boundary. Selim was deposed in 1807, and soon after murdered, as was also Mustafa, who was succeeded by the fierce Mahmoud II., under whom Servia (q. v.) won freedom in 1826, to be followed by Greece (q. v.), aided by the English, Russians, and French in 1829. The mock-reforms of Mahmoud, while they did little good to the Christians, stirred up the Mohammedans to revolt in Bosnia, Albania, and other parts. Egypt threw off the authority of the Porte, and seized Crete and Syria (see MEHEMET ALI), but England procured the return of the latter territory. The quarrel induced by Louis Napoleon between the Latins and the Orthodox, about the Holy Places at Jerusalem, led directly to the Crimean War. The Czar Nicholas again demanded a fuller acknowledgment of his rights as protector of the Orthodox, and on a refusal occupied the Principalities. Abdul-Medjid then declared war, and received the aid of France, England, and Sardinia. The English declaration speaks of the Sultan as 'an ally whose dignity and independence are assailed,' and 'the integrity and independence of whose empire has been recognised as essential to the peace of Europe.' (See OMAR PASHA, SEBASTOPOL, INKERMANN, BALAKLAVA, &c.) The Treaty of Paris (1856) declared that the Porte was admitted to the advantages of public law and the European concert, and engaged the Powers to respect 'the independence and territorial integrity' of the empire. Since 1856 there have been several revolts of the subject nations, notably in Crete (1866–68), and, greatest of all, in Herzegovina and Bosnia in 1875. The last outbreak stirred up the Bulgarians, already inflamed by the excesses of the Circassians, but the Turks met with little opposition in reducing the country by deliberate massacre. The Andrassy Note of 1875, to which the Powers assented, was a mere protest against the action of the Porte. In May 1876 the Berlin Memorandum was drawn up, proposing that the Christians should be allowed arms and that Turkish troops should be concentrated in certain places; but to this Lord Derby refused his assent. In December the Conference of the six Great Powers met at Constantinople. The reforms proposed did not even receive the nominal assent of the Porte, and no guarantee could be given for the working of the constitution projected by Midhat Pasha. During subsequent negotiations, England, by following a policy of resistance not to be ultimately supported by force, was compelled to make many unpalatable concessions. For an outline of the later diplomatic history and of the Russo-Turkish War, see RUSSIA. The principal terms of the Treaty of Berlin are given at the beginning of the present article. During 1876 the Sultan was changed more than once; Abdul-Aziz (succeeded 1861) was set aside and presently died; then came Murad V., to be deposed in favour of Abdul-Hamid II. In terms of the Anglo-Turkish Convention of 9th June 1878, Great Britain undertook the protection of Asiatic Turkey, if necessary 'by force of arms,' and in return the Sultan promised to execute necessary reforms, in guarantee of which the British were allowed to 'occupy and administer' Cyprus. The Marquis of Salisbury subsequently specified certain reforms in Asiatic Turkey, including the abolition of tithe-farming, and the formation of a gendarmerie and of tribunals under the control of Europeans. In January 1879 the Sultan promised to execute reforms 'as soon as the finances of the empire are placed on a better footing.' The scheme of a mixed occupation of Eastern Roumelia was abandoned (April 1879) on the proposal of the Porte not to employ Turkish troops within the province except on the demand of the International Commission, the powers of which are continued for a year. The Bulgarian Assembly has refused to admit the deputies from Eastern Roumelia, and for the present has ceased to discuss schemes for the extension of the Bulgarian frontier. The organisation of Bulgaria has been advanced at least one step by the election as its prince (April 29) of Alexander of Battenberg, a cousin of the Grand-Duke of Hessen and nephew of the Empress of Russia. Respecting one of the most interesting divisions of the Eastern Question, the English Government appear desirous of sparing the susceptibilities of the Porte, while France is anxious to be regarded as the most zealous patron of the Greeks. The Sultan has expostulated with the Khedive for dismissing his European ministers. See for history the works of Knolles, Von Hammer, and Finlay, Zinkeisen's *Osmanisches Reich in Europa* (7 vols. Gotha 1844 *et seq.*), Rosen's *Geschichte der Türkei neuester Zeit* (2 vols. Leip. 1866), Freeman's *Ottoman Power in Europe* (Lond. 1877), Creasy's *History of the Ottoman Turks* (new ed. Lond. 1877), and *Turkey and Russia* (3 vols. Edinb., T. C. Jack, 1877–79); for an account of the country and customs, Baker's *Turkey in Europe* (Lond. 1877), *The People of Turkey* (2 vols. Lond. 1878), by a Consul's Daughter (Mrs. Burt), and *Our New Protectorate*, by J. C. M'Coan (2 vols. Lond. 1879).

Turkish Bath', a popular form of vapour bath, in which the patient, after being subjected for some little time to a considerable temperature in a vapour chamber, is vigorously rubbed down, and is then conducted through a series of cooling chambers until he has regained his normal temperature. All secretions and accretions are thus completely removed from the skin, which is left free to perform its functions healthily.

Turk'ish Lan'guage and Lit'erature. Turkish, or Osmanli, belonging to the Western branch of the Turkic class in the Northern division of the Turanian (q. v.) family of languages, is spoken by the aristocracy of European Turkey, by all government officials in Syria, Egypt, Tripoli, and Tunis, and throughout the whole of Turkestan and the southern provinces of Asiatic Russia. Turkish employs the Arabic alphabet, adding, however, to its twenty-eight consonants, one native and four Persian characters; while Arabic and (through Arabic) Persian words have found their way so plentifully into its vocabulary, that the speech of the higher ranks is barely intelligible to the uncultured peasant. The grammar, purely Turanian, offers a striking instance of the manner in which an agglutinative language (see PHILOLOGY) can, with seemingly slender resources, express the minutest shades of thought. From a single verbal root, for example, thirty-six new bases may be produced by the interpolation of certain letters, *e.g.*, from *sev-mek*, 'to love,' *sev-dir-mek*, 'to cause to love,' *sev-me-mek*, 'not to love,' *sev-ish-dir-il-me-mek*, 'not to be brought to love one another,' &c. Though Turkish, like Finnish, seems to have made advances towards inflection, and though such cognate forms as *ish*, 'a deed,' and *ir*, 'to do,' as *göz*, 'an eye,' and *gör*, 'to see,' show that it has not always preserved the radical portion of every word intact, yet its essential difference from Aryan or Semitic inflectional languages is seen in this principle of incorporating new elements into the middle of a word, from which, indeed, its chief complexity arises. Redhouse has published a *Turkish-English and English-Turkish Dictionary* (2 vols. Lond. 1856–57), and a *Turkish Vademecum* (2d ed. Lond. 1877); and reference may also be made to Max Müller's *Science of Language* (2 vols. Lond. 1862–64), Grimm's *Ueber die Stellung, Bedeutung und einige Eigenthümlichkeiten der Osmanischen Sprache* (Ratib. 1877), Vámbéry's *Etymologisches Wörtenbuch der Turko-tartarischen Sprachen* (Leip. 1878), and Viscount Strangford's posthumous *Letters and Papers on Philology and Kindred Subjects* (Lond. 1878).

As their religion, so also the Turks derive their literary culture from Arabs and Persians; and Turkish writers are less original than numerous. Of the 2200 poets cited by Hammer-Purgstall, the chief are the epicist Lami (d. 1531), Fasli (d. 1560), author of the allegorical *Gül u Bülbül*, the lyricist Baki (d. 1600), and Omar ben Suleiman, founder of a didactic school. Bidpai's Fables were adapted from the Persian in 1540, as also was a version of the *Tuthinâme;* and the Arabic *Latha'if-i Chodscha Nassreddin Efendi* has long been the Turkish *Eulenspiegel.* Seven annalists have chronicled the events of the empire from its commencement to 1774, but all are eclipsed by Hadji Khalfah (q. v.), historian and geographer, whose successors in the field of history are handled by Schlechta-Wssehrd in his *Osmanische Geschichtschreiber der neuern Zeit* (Vien. 1856). There are and have been besides grammarians, commentators on Persian poetry (the name of these is Legion), and writers on medicine, jurisprudence, and religion. Authors, indeed, unless they read one another's works, would seem to be more numerous than

readers, and year by year the number of authors dwindles; so that twenty years hence one will probably sum up modern Turkish literature in the remark, The Turks have none. See Hammer-Purgstall, *Geschichte der Osmanischen Dichtkunst* (4 vols. Pesth 1836–38); and Dora d'Istria, *La Poésie des Ottomans* (Par. 1877).

Turk'manchai, a small town of Persia, province of Azerbijan, 64 miles S.E. of Tabriz, where, February 18, 1828, a peace was signed between the Romans and Persians, by which the latter ceded the Khanats of Erivan and Nakhichevan, and paid a war indemnity of £4,000,000.

Tur'meric, a substance obtained from the tubers of *Cucuma longa*, forming one of the chief ingredients of the renowned 'curry powder;' also useful as a chemical test for the presence of alkalies. The plant has a perennial rootstock with annual stems; the leaves are lanceolate, about a foot long, sheathing each other at the base, and from their centre a short leafy spike of cream-coloured flowers arises. It is a native of the E. Indies, where it is likewise widely cultivated. The Chinese T. is superior to that of Madras, Bengal, or Java. Various beautiful shades of yellow are produced by T., no other vegetable dye giving so brilliant an orange-yellow, but its colour has no permanence. Medicinally it is much employed in the East as a carminative.

Tur'ner, Joseph Mallord William, the great English landscape-painter, was born in London, at 26 Maiden Lane, Covent Garden, April 23, 1775. His father was a hairdresser, and at an early age, and with but a scant general education, T. took to art as a pursuit. Girtin, the reputed founder of the School for Painting in Water-colours, was one of his early acquaintances, and both lads were employed by John Raphael Smith, in Maiden Lane, to colour prints, and subsequently by an architect to fill in skies and foregrounds. At the age of twelve T. exhibited two drawings at the Royal Academy. In 1789 he became a student at the Academy, where for ten years he wrought assiduously, exhibiting during the period no fewer than fifty-nine water-colour pictures. The most notable of these are 'The Tenth Plague of Egypt,' 'Dutch Boats in a Gale,' and 'The Battle of the Nile.' Already had he done work of rare delicacy and strength as a book-illustrator, having contributed views to the *Oxford Almanack*, the *Pocket Magazine*, &c. In his twenty-fourth year (1799) he was elected A.R.A., and removed his studio to 64 Harley Street. Two years later, after being made R.A., he visited France, and this was only the first of a series of wide Continental rambles, during which his pencil was never idle. To this period belong 'Calais Pier' and 'The Falls of Clyde.' His reputation till now was that of brilliant water-colourist alone, but from this time he turned his attention more to oil, and during the next half-century upwards of 200 such works appeared at the Academy. In 1808 he was injudiciously elected to the chair of Perspective at the Academy, a post which he was forced to resign, his artistic qualifications being utterly thwarted by his illiteracy. The famous 'Liber Studiorum' appeared in 1808, and seems to have been suggested by Claude's 'Liber Veritatis,' a series of engravings after which had been published by Boydell with success. Produced in the fulness of the artist's powers, the 'Liber Studiorum' displays T.'s exquisite sense of ærial refinements, and incomparable power of balancing the beauties of sunshine and shadow, apart from the strongly marked conventions of his peculiar system of colour. Most of the plates were engraved by his own hand, but whether the combination of etching and mezzotint employed is really an improvement on either process by itself is an open question with critics. Other engraved series by T. are Dr. Whitaker's *History of Richmondshire*, *The Rivers of England*, *The Rivers of France*, *England and Wales*, *The Southern Coast*, the works of Rogers, Scott, and Byron, and some of Finden's beautiful works. Meantime the work of painting went on unremittingly, the period of the 'Liber Studiorum' seeing such masterpieces as 'Crossing the Brook,' the 'Frosty Morning,' 'The Sun rising through a Mist,' 'The Shipwreck,' 'Falls of Schaffhausen,' 'The Blacksmith's Shop,' and 'Wreck of the Minotaur, Spithead.' Disappearing suddenly from London, as suddenly to reappear, he passed great part of his life in the closest study of nature. In sketching, his manipulation is so dexterous and magical that paper and pigments are lost in the sense of an atmospheric medium illuminated by colour, and stretching into illimitable space. Besides those already mentioned, his greater works are 'The building of Carthage,' 'Hannibal crossing the Alps,' 'The Bay of Baiæ,' 'Mortlake,' 'Ulysses deriding Polyphemus,' 'Childe Harolde,' 'The Slave Ship,' 'The Burial of Wilkie,' 'Death of Nelson,' 'Hail, Rain, and Speed' (a railway train by night), and 'The Fighting Téméraire.' Ruskin, T.'s most eloquent advocate, is betrayed into extraordinary exaggeration of the neglect which the painter suffered in his lifetime. At his death, which took place at Chelsea, 19th December 1851, he had amassed by his art a fortune of £140,000, and by his will he disproved the charge of vulgar avarice, based on the mysterious eccentricity of his life, for he bequeathed some fifty of his finest works to the National Gallery, and devoted his gains to the foundation of an asylum for decayed artists. T.'s benevolent purpose miscarried through a technical defect in the will; but on the score of benevolence as well as artistic fame he was entitled to his resting-place beside Reynolds in the crypt of St. Paul's, where a statue to him was raised in 1862. In the *Modern Painters*, which took the world of art by storm some thirty years ago, Ruskin extolled T. with an extravagance of splendid eulogy which for a time silenced dissent, but a reaction of sentiment is already visible. Above everything else T. was lauded as a colourist, as the only painter of sunshine, the perfecter of the colour chord by means of scarlet, and it is exactly T.'s gifts of colouring which are now challenged by the 'higher' critics, who urge that what now passes for extraordinary imaginative resource will, in an impartial estimate of T.'s art, be curtly dismissed as exaggeration and artifice. No one has disputed the pre-eminence asserted for T. by Ruskin as the painter of the sea in all its 'power, majesty, and deathfulness.' Perhaps the greatest sea-pieces ever painted are the tragic 'Slave Ship' (1840) and the 'Snowstorm' (1842). Ruskin wrongly claimed T. as a Pre-Raphaelite. All authorities now agree that in his closing years the brain, and with it the eye of the painter, became diseased, and hence the incoherence of his later works. All divisions of his art into periods must give way on examination, for it is found that the development is not exactly traceable, that the periods intermix and overlap, that naturalism invades idealism, that simple effects and unobtrusive truths are interspersed by Claude-like reveries. 'A subtle and delicate but unfaithful draughtsman, a learned and refined but often fallacious chiaroscurist, a splendid and brilliant but rarely natural colourist, a man gifted with wonderful fertility of imagination and strength of memory'—such was T. in the opinion of Mr. Hamerton, his latest and most critical biographer. See Ruskin's *Modern Painters*, and the Lives by W. Thornbury (Lond. 1861), and Hamerton (Lond. 1879).

Turn'er, Sharon, an English historian, was born in London, September 24, 1768. The first fruits of his historical investigations appeared as *History of the Anglo-Saxons* (vol. i. 1799), and at once established his reputation. He continued his narrative down to the reign of Elizabeth, the last volume of the series being published in 1829. The later portions of the work are of less value than the earlier portion. Among his minor productions may be maintained, *Inquiry respecting the early Use of Rime* (1802), *A Vindication of the Genuineness of the Ancient British Poems of Aneurin, Taliesin*, &c. (1803), which was called forth by the strictures of the *Critical Review* (1800) on the first volume of his history, *Sacred Meditations* (1810), and *The Sacred History of the World* (1832). After many years of failing health T. died in London, February 13, 1847.

Turnhout', a town of Belgium, 24 miles N.E. of Antwerp, forming the terminus of a branch line of the Brussels and Antwerp Railway. It has several bleach-works and paper-mills. Pop. (1876) 15,743. On the heath of Tiel, in the neighbourhood of T., Prince Maurice of Nassau with 800 Netherlanders annihilated a picked army of 2000 Spaniards under Count Varax, January 24, 1597. Here also, on 27th October 1789, the Austrians were defeated by the patriots under Van der Mersch.

Turn'ing consists of the shaping or cutting down of hard substances while in rotation by means of special cutting or abrading tools. Articles in wood, bone, ivory, iron, steel, brass, and other metals are turned, and the process is equally applied to the production of buttons weighing only a few grains, to the shaping of enormous propeller shafts of screw-steamers, and to the boring of guns weighing many tons. The lathe and appropriate cutting-tools are the essential instruments. The simplest form of lathe consists of a framework on which is placed a horizontal *lathe-bed*, over which is mounted at one end the *lathe-spindle*, moved by

a *driving pulley* set in motion either by foot or by power. Attached to the spindle is the *fixed head-stock*, and at the opposite extremity of the bed, but capable of being moved backwards and forwards, is the *movable head-stock*. On the front of the lathe-bed is mounted the *saddle* having the *tool slide* or rest on which the cutting or shaping tools are held while they are pressed against the material on which the T. operation is being performed. The substance to be turned is centred and fixed against the fixed head-stock by means of a *chuck* or *face-plate* on the one side, and in the *screw spindle* of the movable head-stock at the other, the revolution of the lathe spindle by the driving pulley giving the material its motion of rotation. From these simple elements the lathe develops by addition and modification, and endless variety of complementary adjustments and appliances for reversing motion, for altering speed and power, for moving longitudinally the object to be turned, for fixing and moving the cutting-tools, for spiral T., and for producing innumerable curvilinear combinations for decorative purposes. For the production of an engraved pattern formed of a variety of curved lines, such as may be seen on the backs of watches, on bank-notes, &c., a *rose engine-lathe* is employed, in which rotatory motion is combined with an oscillating motion (either of the work or the cutting-tool), obtained by the use of suitable cams or *rosettes* having wavy edges. Though the lathes for wood T. and for all other T. operations are the same in principle and operation, many mechanical details and variations of structure are found in engineering lathes which are not necessary for the T. of wood. The implements ordinarily used in T. wood are chisels with skew edges, and gouges or curved chisels; but for under-cutting and scooping out internal work, special forms of cutting-tools are required. In cases where large quantities of any one form and size of a turned article are required, such as for tool-handles, or chair or table legs of uniform pattern, an enormous economy of time is effected by having single cutting-tools of the contour of the article to be turned fixed to the lathe. For this purpose a sliding frame to suit the dimensions of the article to be made is arranged and fixed between the head-stocks of the lathe. The slide contains two instruments or knives made the entire length of the article, the first for roughing out the work, and the second for finishing it accurately and unerringly to pattern. Both these tools are set on skew to take the cutting action in detail and so prevent the enormous strain which would be caused by cutting at every point of a lengthened surface at the same instant. By means of this device a table-leg which would by handiwork require an hour's T. is finished in less than a minute, and indeed more time is occupied in fixing and removing the work than in T. Thread-spools are fixed, turned, and thrown off with wonderful rapidity by automatic machinery. The tools for T. iron, steel, and hard metals are always fixed in a tool-rest. They are simple in outline, and narrow in their cutting-edges, but they must be made of the finest hard-tempered steel, and of great strength.

Tur'nip (Lat. *Terræ napus*) is the cultivated *Brassica rapa* of Linnæus, included by Dr. Boswell in his *B. polymorpha* (see RAPE). Two varieties are apparently found in a wild state in Britain, the one biennial (*sylvestris*), the other annual (*Briggsii*). The first of these scarcely differs from the cultivated T., except in having a thin, stringy root. It may be only the plant retrograding to its original wild form. The use of the T. extends back to the time of the Greeks and the Romans. It would appear to have occupied a similar position in Roman culture that it does in the husbandry of the present day. Columella, who wrote on horticulture early in the 1st c., recommended that the growth should be abundant, as the supply not required for human food could with advantage be given to cattle; and his testimony coincides with that of Pliny in esteeming the T. next in utility and value to the cereals. We have no record of its introduction into England, nor any early mention of its use. In the reign of Henry VIII. the T. was eaten baked, or roasted in ashes, and the tender tops used as a salad. During Elizabeth's reign, boiled T. was a favourite dish. The T. is now widely grown both for domestic use and farm-stock feeding. For household service, the root, in broths, soups, stews, and entire or mashed as a table vegetable, is general in all temperate climates; the leaves and flower-shoots are used as greens, and the seed-leaves as a salading. Numerous varieties are in cultivation, varying in shape as globose, oblong, depressed; in period of maturity—summer sorts and winter sorts—and in delicacy of flesh and flavour. The Swedish T., or 'Swedes' of agriculturalists, which was introduced into Britain from northern Europe at a comparatively recent date, is *B. rutabaga* of De Candolle. It may be known from the T. and other near allies by the glaucous hue of the radical leaves, the pale buff-orange tint of its larger flowers, and the shape of the root.

Field culture of the T. has proved of great advantage in British agriculture, supplying a very desirable rotation crop, and providing a winter food for cattle and sheep, which was previously a desideratum. The system is carried to perfection in Scotland, where the climate admirably suits the requirements of the T. When the crop is gathered, the roots either serve for present feeding, or may be stored in house or heaps for future service. Frequently about a third of the crop is left on the ground, to be eaten by sheep, which are from time to time transferred to certain portions of the field, and confined to the desired limits by movable fences. The land thereby receives throughout a supply of good manure. As to soil, the T. thrives best in one that is rich and free. The mode of culture differs according to the characteristics of the soil. By the gardener the seeds are sown and allowed to grow much closer than by the farmer. In the Himalaya, the T. is cultivated up to 15,000 feet. During very dry seasons, the T.-leaf is liable to the attack of mildew, to the great detriment of the crop; also to gouty excrescences on the root (called anbury), arising from the presence of insect grubs. The malformation of the root into the state called 'fingers and toes,' or *dactylorhiza*, sometimes produces much loss—the root dividing, and becoming hard and worthless. This disease seems to be a tendency of the plant to return to its *wild* form, and is best met by the farmer using new and selected seed. As the T. for food purposes contains nearly 93 per cent. of water, and no starch, it is not a nourishing article of diet.

Tur'nip Fly, a term applied to various insects, the larvæ of which are destructive to the turnip plant. *Anthomyia radicum* is a species of T.-F. belonging to the family *Muscidæ*, which includes the house-fly and its neighbours. The larvæ attack the root of the turnip. Another species is the *Haltica nemorum*, often named the 'turnip-flea,' a species of beetle, represented in America by the *H. striolata*. It attacks the leaves and root of the turnip. This species is common in meadows in Britain from April to October, and may be recognised by two yellow stripes on its wing-cases.

Turn'stone (*Cinclus interpres*), a species of *Grallatorial* or wading birds, so named from its habit of turning over small stones in search of marine worms and other animals on which it feeds. The T. is of a white and black colour, the latter hue predominating on the breast and upper part of the back. The under parts are a pure white, and the legs and toes are orange. The average length is 9 inches. The T. also occurs in N. America. Its nest is built on the coast-line, and the eggs, which number four, are coloured of an olive-green hue, streaked with brown. The breeding-season occurs in June. The T. in Britain breeds chiefly in northern islands.

Tur'pentine is an oleo-resinous product obtained from the trunk of various trees, chiefly of the coniferous class; but a similar substance also called T. is yielded by two species of *Pistacia*. T. is a more or less viscid body, resulting from the solution of several resins in the oil of T., popularly known in its separate form as spirit of T. The following embrace the principal kinds of T. recognised in commerce. *Common T.*, a product largely obtained in the United States from various pine-trees, but principally from *Pinus palustris* and *P. Tæda*, while essentially the same substance is produced in Germany from the Scotch fir, *P. sylvestris*. The substance has the appearance and consistence of honey, with a pungent, aromatic odour and a hot taste. Distilled, either by itself or with water, it separates into oil of T., which comes over, leaving in the still rosin or colophony, and it is in these separate forms that T. comes principally into commerce. *Bordeaux T.* is an analogous substance yielded by the sea pine, *P. maritima*. *Strassburg T.*, which forms a clear transparent liquid, is yielded by the silver fir, *Abies pectinata*, and the spruce fir, *A. excelsa*. *Venice T.*, yielded by the larch-tree, *Larix Europæa*, is a viscid, opaque, brownish liquid with a rather disagreeable odour. *Hungarian T.* is yielded by *Pinus pumilio*, and *Carpathian T.* by *P. cembar*, the product in both cases being a clear thin liquid. Canada

Balsam (q. v.) is also a T., and so is Burgundy pitch. *Chian* or *Cyprus* T. is obtained in the Levant from *Pistacia terebinthus*, and in Asia Minor from *P. vera*. It may be obtained clear and of a yellow tinge, but usually is somewhat cloudy with a greenish hue It is nearly allied to mastic, a substance obtained from another tree of the same genus. The various kinds of T. are also used as varnishes, but very largely they are separated by distillation into Rosin (q. v.) and Oil of T. (q. v.).

Medicinal Properties of T.—T. is employed in medicine as a stimulant, diuretic, and anthelmintic, and also as a styptic in cases of hæmorrhage from the lungs and stomach. T. is the most actively stimulating of all the diuretics, and may be employed in urinary incontinence dependent on debility of the bladder, in passive hæmaturia, and in amenorrhœa when great local debility exists.

Tur'pentine, Oil of, is obtained by distillation from the various kinds of commercial turpentine and also by distillation of fir leaves, tops, and cones. All the varieties of oil have the same ultimate chemical composition, $C_{10}H_{16}$, but they vary in physical and optical properties, and are really mixtures of two or more distinct hydrocarbons. Its chief use is as a solvent for varnishes and certain kinds of painters' colours.

Tur'pentine Tree is *Pistacia Terebinthus*. See PISTACIA.

Tur'pin, or, as the name appears in the oldest Latin documents, **Tylpi'nus**, a bishop of Rheims, who died about 800 A.D., and who is said to have been a friend and companion of Karl the Great. His name was used to give credit to a work, *De Vita Caroli Magni et Rolandi*, the first part of which is supposed to have been written by a Spanish ecclesiastic of the 11th c., to encourage the pilgrimage to Compostella; while the second part is assigned either to Pope Callixtus II., or to an unknown ecclesiastic who had accompanied him on a visit to the shrine of St. James. Frequently translated, redacted, and utilised as an authority, it exercised a wide influence on the subsequent literature of the Charlemagne legend. It is printed in Simon Schard's *Rerum Germanicarum Chronographi* (1566), Reuber's *Scriptorum qui Cæsarum et imperatorum, &c.* (Hanau 1619), and Reiffenberg's edition of the *Chronique de Philippe Mouskes* (Brussels 1836). Ciampi gave a separate edition (Florence 1822); and Gaston Paris reviewed the history of the work in his *De Pseudo Turpino* (Par. 1865).

Tur'pis Cau'sa, a phrase of Roman law imported into Scotch law, denoting an immoral consideration as the basis of an obligation. When the immorality is on the side of him who has given the consideration, he is not entitled to restitution; if it lie with the receiver, the reverse is the case; if it lie with both, then possession prevails.

Tur'quois or **Tur'quoise**, an opaque precious stone, of a greenish-blue colour, consists essentially of a phosphate of alumina coloured with copper. It is only found in a mountain region in Persia, where it occurs in veins traversing the rocks in all directions; impure varieties, valueless as precious stones, being found in Saxony and Silesia. The name T. is a French form of Turkish, and indicates that the stone first came to Western Europe by way of Turkey. Pure pieces the size of a hazel nut are very rarely obtained. The T. has been known and highly esteemed as a stone for rings and jewellery generally from remote times, and it is elaborately described by Pliny. Singular properties were in mediæval times attributed to the T. It was supposed to strengthen the eyes and cheer the mind of its wearer; it saved him from accidents, it paled in his sickness, and lost colour on his death. In Germany it is the proper stone for a betrothal ring; the permanency of its colour indicating the constancy of the lover's affection.

Türr, General Stephan, was born at Baja, in Hungary, 10th August 1825, became a lieutenant in the Austrian army in 1848, and served his first campaign in that year in Italy under General Radetzky. In January 1849, in obedience to the command of the revolutionary government of Hungary, he deserted to the Piedmontese, and was appointed Colonel of the Hungarian legion in the service of the latter. After the disaster of Novara he passed into the duchy of Baden, and served in the revolutionary army, which, however, was soon defeated. The Hungarians took refuge in Switzerland, the government of which aided many to emigrate to the United States. T., however, remained in London on a pension granted by the Sardinian government. On the outbreak of the war with Russia, he went to the Crimea, took part as a volunteer in several battles, and received a commission from Colonel M'Murdo. Despatched in 1855 to the Danubian provinces to purchase horses, T. was arrested at Bucharest by the Austrians as a deserter, sent to Vienna, tried by a court-martial, and condemned to death. On the vigorous remonstrance of the British government his sentence was commuted to perpetual banishment. In the Italian war of 1859 he was a member of Garibaldi's staff, and in the war in Sicily his aide-de-camp, and before Palermo was appointed a general of division. T. was appointed by Victor Emmanuel in 1861 general of division in the army of Italy, and Commandant of Naples. In the same year he married the Princess Adeline Wyse Bonaparte. He resigned his command in 1864, and in 1869 returned to Hungary, where he now (1879) resides, busied with canals and other industrial undertakings. See his *Arrestation, procès et condamnation du Général T. racontés par lui-même* (1863), and *La Maison d'Autriche et la Hongrie* (1865), and Schwarz, *S. T.* (Vien. 1868).

Turreti'ni is the name of a celebrated family of Genevan theologians, descended from a Gonfaloniere of Lucca, whose son, **Francisco**, had to take refuge in Geneva on account of his religion in 1579, and there died.—**Benedictus T.**, his son, was born at Zurich, 9th November 1588, became pastor at Geneva in 1612, and professor of theology in 1618; represented the Genevan Church at the Synod of Alais in 1620, and in the following year concluded successfully an alliance between Geneva, the States-General of Holland, and the Hanseatic towns. He died 4th March 1631, leaving behind him many theological writings.—**Franciscus T.**, son of the preceding, was born 17th October 1623, studied at Geneva, Leyden, Paris, Montauban, and Nismes; became pastor, and in 1653 professor of theology in his native city, where he distinguished himself as an opponent of Amyraldism, and a staunch upholder of the decisions of the Synod of Dort, ultimately formulating his views in 1670, in conjunction with several Swiss divines, in the Klostic *Formula Consensus*. He died 28th September 1687. His most celebrated work is the *Institutio Theologiæ Elenchticæ* (Geneva 1679–85), of which a reprint, with selections from his other writings, was published at Edinburgh (1847-48).—**Joannes Alphonsus T.**, his son, born 13th August 1671, abandoned the strict Calvinism of his ancestors in favour of a mode of thought resembling the contemporary Latitudinarianism of England, and endeavoured to unite the various sections of the Protestant Church on a more liberal basis. It was chiefly owing to his efforts that the Genevan Church resolved in 1706 to make the signing of the Formula Consensus, drawn up by Francisco T., optional in the case of candidates for the pastorate. T. studied theology at Geneva and Leyden, visited the English universities, where he formed several personal friendships, and spent some time in Paris. In 1697 he was appointed to the chair of ecclesiastical history at Geneva, from which in 1705 he was transferred to that of systematic theology. He died at Geneva, 1st May 1737. Of his numerous works the most important are *Cogitationes et Dissertationes Theologicæ* (Gén. 1703, 1737); *De Veritate Religionis Christianæ* (Gén. 1721-23); and *Hist. Eccl. Compendium* (Gén. 1700, 1734), often re-edited and translated. A very full account of the family is given in Herzog's *Realencyklopaidie*.

Turr'et-Ship, an ironclad ship of war, whose armament is mounted in one, or more than one, low circular tower or turret placed on the deck, and revolved by hand or steam power. This arrangement affords a wide horizontal fire, and capability of firing the same guns on both sides of the ship—a great advantage over broadside guns, which can only be trained through small arcs. The maximum of offensive power and minimum of armoured area are combined in a T.-S. The sides of the ship are made much lower than in broadside ironclads, and this reduction of surface enables the remaining portions to be very heavily armoured, and guns of the weightiest nature to be carried. The advantages to be derived from the use of revolving turrets for land and coast defence were clearly pointed out by M. Baltard in a work published at Paris in 1831; T. R. Timby, of Saratoga, U.S., caveated in 1843 the invention of a revolving turret of iron for use on land or water; Captain Ericsson designed in 1855 the 'monitor' type of vessel; and about the same time Captain Cowper Coles, R.N., contrived a

turret system differing from Ericsson's in some important particulars. The United States adopted Ericsson's plan, while Coles' system was put in practice in the British navy. The *Monitor*, designed by the former inventor, was launched early in 1862. Her deck was only 18 inches above the waterline, and on a metal ring in the centre of the deck a turret (20 feet in diameter and 9 feet high) was placed, which had two ports for 11-inch guns, the whole rotating on a central spindle by steam. She proved a most formidable ship, and her name is now applied to all ironclads constructed on the same principle of low freeboard with gun-turrets. Her defects were remedied in other monitors subsequently built. The *Dictator* class of monitor carries 10 inches of plate iron (backed by 3 feet of oak) on the sides and 15 inches in the turret walls, which enclose two 15-inch guns. Some monitors have two, others three turrets. The *Miantonomoh* and *Monadnock* have made successful voyages in the Atlantic and Pacific. The chief disadvantages of these monitors, arising from the turrets being raised so little above the water, are that the guns cannot be used in heavy weather, for the ports must then be closed to keep out water, and that the revolution of the turrets is in danger of being stopped by a plunging fire from broadside guns directed to the junction of the turrets with the deck. Different classes of British ironclads carry Coles' turrets at an elevation considerably over that of American monitors. The turrets pass through the upper deck, and rest on a broad base and cone rollers on the deck below, rotation being effected by a winch or steam power. The *Monarch* is a double-turreted full-rigged ship. The sister ship to this ironclad was the ill-fated *Captain*, designed by Captain Coles, which foundered, owing to pressure of sail assisted by a heavy sea and a want of proper stability, off Cape Finisterre in September 1870, with the lamentable loss of 500 lives, including that of the unfortunate designer. The class of turret-ships for coast defence, of which the *Glatton* is the type, are mastless and sailless 'breastwork monitors,' having a low freeboard, an iron plated deck, and one or more turrets commanding an all-round fire. The bases of the turrets are protected by a massive breastwork rising 6 feet from the hull, and the freeboard is thus heightened for a considerable portion of the vessel's length. Over the turrets a hurricane or flying deck is erected, which serves for the stowage of boats. The same general plan is followed in the much larger seagoing turret-ships, of which the *Thunderer* or *Devastation* is a typical example. The *Thunderer* has a freeboard of 4 feet 6 inches, plated with 12 inches of iron, and two turrets (15 inches thick), each with two 35- or 38-ton guns. The *Inflexible* class are constructed on the 'central citadel' principle, the middle part of the ship—embracing turrets (18-inch armour), machinery, and magazines—being protected by an iron citadel, 2 feet thick, extending from 6 feet below the waterline to 10 feet above it for a length of 110 feet. The turrets are placed diagonally, to command a fire ahead and astern as well as abeam. The ends before and abaft the citadel are unarmoured, and serve to accommodate the crew and to carry coal. The armament consists of four 81-ton guns throwing a projectile weighing nearly three-quarters of a ton. The monster guns of these turret-ships are loaded and worked by hydraulic machinery.

Turritell'a, a genus of Gasteropodous Mollusca, the type of the family *Turritellidæ*, in which there is a tubular spiral shell, frequently turreted. The operculum is horny, and the foot small. The T. is abundant in existing seas.

Tur'tle, the name given to various members of the Reptilian order *Chelonia* (q. v.). In the section known as that of the *Eureta*, and in which the T. are included, the beak is hooked and exposed, and the snout blunted. The *tympanum* is concealed by the integument. The front pair of limbs are longer than the hinder pair, and are converted into swimming-paddles. The fingers or digits are flat and long, and are bound together by the integument or skin. The nails are but feebly developed. The skin or integument may be soft and rugose, as in *Sphargis*, or may be covered with thick epidermic plates as in the familiar tortoise-shell T. (*Chelone imbricata*). Properly speaking, these two genera are the only true turtles, but other members of the order Chelonia are often so designated, as *e.g.* the Mud T. The Luth or Leathery T. (*Sphargis coriacea*), named from the soft, leathery-like integument which coats the shell, occurs in the Atlantic, Pacific, and Indian Oceans, and may measure 6 feet in length, attaining a weight of over 1600 lbs. The skin of the back is ridged, or elevated into a series of very prominent lines. The lower jaw is markedly hooked, and the toes are devoid of nail. The colour is a dark brown spotted with yellowish patches. The Hawksbill T. (*Caretta* or *Chelone imbricata*) is the species from the epidermic plates of which 'tortoise-shell' is obtained. It is a native of tropical seas, and may attain a length of from 3 to 4 feet. The plates are stripped off the back after the animal has been exposed to a strong heat. A second set of plates, of inferior quality, grows after the first have been removed. The colour of the Hawksbill T. is yellowish, marbled with brown, the under parts being of a dirty white. The Green T. (*Chelone viridis* or *mydas*) is the species best known on account of its furnishing the materials for the famous soup. It is common at the Antilles and round the Ascension coast. It is captured by intercepting it on its native sands, and turning it over on its back, its unwieldy bulk rendering it impossible for the T. to right itself. It may be captured at sea by harpooning, and also by means of the Remora (q. v.) or sucking-fish. The eggs of this T. are accounted great delicacies. The tenacity of life of the Green T. and of other species has long been a subject of remark. These reptiles will exhibit signs of sensitiveness in their tissues for weeks after decapitation—a fact depending on the slow, languid circulation, and on the low vitality of the tissues. Such forms as the Snapping T. (*Troiynx ferox*) and the Tyrse (*T. Niloticus*) belong to the group of the soft Tortoises (q. v.). The Loggerhead T. (*Caouana caretta*), allied to the Hawksbill T., is a fierce species, biting with great force and severity on provocation. It has a wide range, occurring in the Atlantic and in northern limits.

Tur'tle Dove (*Turtur auritus*), a species of *Columbidæ* or pigeons migrating from Africa to England, arriving in Britain in May, and leaving in August or September. The average length of the T. D. is about 11 inches. Its colour is a pale brown, marked with a darker hue above. Four rows of black feathers, tipped with white, decorate the side of the neck; and the top of the head is of a slaty-grey hue, while the under parts are white. A purple tint pervades the feathers of the breast. This bird is tolerably common in the southern English counties. The nest is built on the forked bough of a tree, and both parents sit on the eggs during incubation. A single brood, averaging two in number, is produced in the course of each year. The bill is more slender than in other pigeons, and the upper mandible is prominently ridged. An allied species, the Laughing T. (*T. risorius*), is so named from the peculiar grating nature of its cry. Its prevailing colour is a brownish grey, a black collar encircling the hinder part of the neck.

Tus'can Order of Ar'chitecture. See COLUMN.

Tus'cany, now a part of the Kingdom of Italy (q. v.), was from 1569 till 1860 a sovereign grand-duchy, surrounded by Parma, Modena, the Papal States, and the Tyrrhene Sea. T. corresponds to the N. of the ancient Etruria (q. v.). After the fall of the Roman Empire, it passed to the Goths, then to the Lombards, then to Karl the Great, and about 828 was erected into a marquisate, of which the S. part was bequeathed to the Pope by the Countess Mathilda (1115). In the N. gradually arose the flourishing republics of Pisa, Siena, Lucca, and Florence (q. v.), of which the latter, under the Medici (q. v.) family, became the chief. T. was made a duchy in 1531, a grand-duchy in 1569. The Medici line dying out in 1737, it was passed by the Treaty of Vienna (1738) to Francis, Duke of Lorraine. T. was annexed to Sardinia (q. v.) in 1860, when it had an area of 8440 sq. miles, and a pop. of 1,826,830. See Von Reumont, *Geschichte Toscana's seit dem Ende des Florentinischen Freistaats* (2 vols. Gotha 1876-77).

Tus'culum, an important city of ancient Latium, 15 miles S.W. of Rome, was founded according to legend by Telegonus, son of Odysseus and Circe. From the time of the battle of Lake Regillus down to the conclusion of the Latin War in B.C. 335, T. is frequently mentioned by Roman historians, and with few exceptions as a faithful ally of the imperial city. From that time till the close of the Republic it sinks altogether out of sight, but from about 80 B.C. it was brought into notice again by Lucullus as a fashionable resort of the leaders of Roman society. After the downfall of the Empire T. regained not a little importance, its counts being for some centuries supreme in Rome. It was destroyed at the instance of the German Emperor in 1191. The ancient town has been identified with the modern Frascati (q. v.).

Tuss'ac Grass (*Dactylus cæspitosa*), a native of the Falkland Isles, Fuegia, and S. Patagonia, is so called from its densely compact growth of large isolated hillocks or 'tussocks' of from 3 to 6 feet high, from which spring annually long leaves and robust leafy stems. The young growth contains a large quantity of saccharine constituents, rendering the plant a useful food-supply. Several attempts made to establish it upon seaside districts in Scotland have as yet failed of success.

Tuss'er, Thomas, best known as the author of *Five Hundred Pointes of Good Husbandry*, was born probably about 1515, at Rivenhall, near Witham, in Essex. From his rhyming autobiography it would appear that he served as a chorister first at Wallingford Chapel, and afterwards at St. Paul's, had the honour of being flogged if not instructed by Nicholas Udall at Eton, was attached for a number of years to the court, probably in the capacity of a musician, and at a later date kept a farm for some time in Suffolk. He probably died at London somewhere between 1580 and 1585. His will was privately printed in 1846 at Great Totham, Essex. The *Five Hundred Points* were first published in 1573, having been preceded by *A Hundred Good Points*, which had seen at least five editions since its appearance in 1557. In rude rustic rhymes, which have hardly a claim even to the name of verse, he inculcated a good amount of sound agricultural wisdom; and the book is still of interest for the glimpses it affords of the country life of the times, as well as for occasional passages of quaint and vigorous expression. The best editions are Dr. Mavor's (1812), Arber's (1870), and the English Dialect Society's (1878).

Tussila'go is a genus of *Compositæ* consisting of a single species, *T. farfara*, a very common British plant on damp heavy soil, and called popularly the 'coltsfoot,' from the shape of its leaf. Its heads of bright-yellow flowers appear in March and April, succeeded by fruits bearing a soft snow-white pappus. The leaves, which develop subsequently, are broadly cordate and angular, cobwebby above and densely cottony beneath. It is dispersed through Europe, Asia, and North Africa. The name T. is derived from the Latin *tussis*, and the leaves are still used as a *cough* remedy, more especially for asthma. The web from the leaves makes a good tinder. *Petasites vulgaris*, or butter-bur, was formerly included in the genus T. Its leaves, in shape and size like those of the garden rhubarb, render it a conspicuous plant by river sides in many parts of Britain.

Tuss'ock Moth (*Laria pudibunda*), a species of *Lepidoptera* (q. v.), the larvæ of which effect much damage in hop plantations. It attains the length of an inch. It is white below, and of a greyish hue, marked by irregular dark lines above.

Tuticorin (*Tutukudi*), a town in the district of Tinnevelly, Madras, British India, near the S. extremity of the peninsula, 70 miles N.E. of Cape Comorin, and 513 S.W. of Madras by rail. Pop. (1871) 10,565. In the roadstead here, where ships ride safely 2½ miles from the shore, is conducted all the sea-borne trade of the district. In 1874-75 the exports were valued at £890,337; the imports at £406,453. There is a pearl-fishery in the neighbourhood. T. has acquired increasing importance as the terminus of the S. Indian Railway. The Prince of Wales disembarked here from Ceylon in 1875, and proceeded N. in the first train that opened the line.

Tu'tor is, in Scotch law, the guardian of a boy or girl in *pupilarity* (see AGE). A father is T. to his children by common law. Failing him, there may be three kinds of T.,—*T.-nominate*, *T.-at-law*, or *T.-dative*; the division being borrowed from the Roman law. A T.-nominate can only be appointed by the father, either under his will or by some writing clearly indicative of his wish. He is not generally bound to find security for his *Intromission* (q. v.) with the estate of his pupil, but the Court of Session may ordain him to do so. A T.-at-law is appointed by the Court when there is no T.-nominate, or when he dies, or does not accept. The nearest relation by the father is usually appointed if twenty-five years old and able to give security. But the T.-at-law has only the custody of the pupil's estate, his person being intrusted to his mother, or, failing her, to his nearest relative on her side. A *T.-dative* is named by the Crown when there is no *T.-nominate, nor at-law*. The office is in all cases an unpaid one, and the T. is bound to make inventories and to keep accounts. For certain important acts—selling land, for example—he requires the sanction of the Court of Session.

Tutt'lingen, a town of Würtemberg, Germany, on the Danube, 16 miles S. of Rottweil by rail. It has manufactures of cutlery, woollen goods, and leather; glue-boiling, bleaching-works, and breweries; besides some trade in corn with Switzerland. Ludwigsthal, in the neighbourhood, has large iron-hammer works. The ruined castle of Honberg overlooks the town. Pop. (1875) 7231. Here on 24th November 1643 the Imperialists defeated the French.

Tutt'y-powder, an impure oxide of zinc collected for medicinal purposes from zinc-smelting furnaces.

Tutui'la, the most central island of the Samoan group (q. v.) in the S. Pacific. Area 90 sq. miles; pop. 6000. The coast is precipitous, and the island is traversed by a sharp mountain-ridge 2500 feet high, too steep to be crossed, and clothed with luxuriant tropical vegetation. The island is nearly cut in two on the S. by the inlet of Pago-Pago, an ancient crater, which now forms a deep and landlocked harbour.

Tver, a government of Russia, surrounded by the governments of Novgorod, Jaroslav, Vladimir, Moscow, Smolensk, and Pskov. Area 25,223 sq. miles; pop. (1877) 1,568,000. From the Volchonski Forest, a range of thickly wooded limestone hills in the W., offsets running between lakes and swamps intersect almost the whole of T. In the Ostashkov district are the headwaters of the Volga, Düna, and Msta. T. is drained by the Volga and its affluents. The Volga is connected with the Msta by the canal of Vishnij Volotchok, and by the Mologa and the Tichvin Canal with the Tichvinka and Sias, which run into Lake Ladoga. There are 100 lakes in T., of which the largest are Seliger, Ochvat-Shadenje, and Steresh. One-fourth of the surface is forest. Potatoes and flax are increasingly cultivated. The chief occupations are the cutting and floating of wood, and the preparation of tar, pitch, and turpentine. In 1873 the cotton, hemp, and flax weaving industries employed 16,363 workmen.—**T.**, the capital, lies on both sides of the Volga (here crossed by a bridge of boats 680 feet long), at its confluence with the Tverza and the Tmaka, 110 miles N.W. of Moscow by rail. It has fine streets and squares, an Imperial palace, a cathedral, and thirty-three churches, several monasteries, a priests' college, a gymnasium, a technical school, a cavalry cadets' school, a teachers' seminary, a ladies' college, several benevolent institutions, and a theatre. There are 28 factories (2 cotton-spinning, 2 cotton-weaving, 1 chintz-making). Its position on the St. Petersburg-Moscow Railway and on the river Volga gives T. great transit-traffic, which is chiefly in corn and metal wares. Entirely burnt in 1763, T. was speedily rebuilt by Catharine II., who has here a monument. Pop. (1875) 38,248.

Tweed, the most famous river of Scotland, rises near Hart Fell, in the S. of Peeblesshire, flows N.N.E. through that county, then E. through the northern parts of Selkirk and Roxburgh shires, and finally N.E. between Berwickshire and Northumberland, discharging into the North Sea at Berwick after a course of 96 miles. It receives from the left the Lyne, Gala, Leader, and Whitadder; and from the right the Ettrick, with the Yarrow, the Teviot, and the Till; and it passes on its course the towns of Peebles, Innerleithen, Melrose, Kelso, Coldstream, and Berwick. The varied beauty of the scenery through which it flows—wild moorlands, winding vales rich in wood or pasture, and broad-stretching finely-cultivated plains—as well as its romantic and historical associations, make T. the most interesting of Scottish rivers. There is hardly a place upon its banks, or those of its tributaries, which is not celebrated in song or story. The genius of Scott in particular has conferred upon it a world-wide fame. The T. is hardly navigable above Berwick. It is celebrated for its trout and salmon fishery.

Tweed'mouth, a small seaport of Northumberland, on the right bank of the Tweed, opposite Berwick, of which it forms a suburb, and with which it is connected by a fine old stone bridge of fifteen arches and a magnificent railway viaduct. It has manufactures of steam-engines and mill machinery, sailcloth, cordage, and linens. Pop. (1871) 2809. Adjoining it is Spittal, a favourite watering-place, with a pop. (1871) of 1742.

Tweeds, a class of woollen textiles of a stout, close-woven, lightly-felted texture, used specially for male clothing, but also

to some extent employed for ladies' cloaks and mantles. The manufacture originated at Galashiels, and early in the present century took root in the towns of the Tweed valley, whence it is commonly supposed the name T. arose; but in reality the name is due to a mistaken reading of 'Tweel,' under which term the fabric was originally known. T. are woven as twills, and the distinguishing characteristics of the fabrics are strength and flexibility, due in the first place to the genuine and excellent quality of the woollen yarns of which they are woven; and, secondly, to the fact that they are but lightly raised and cropped in the finishing processes. Neutral colours predominate in T.; whites, greys, browns, and blacks being the predominant colours, and these are woven into checks, stripes, or mottles, the patterns being in all cases small and little pronounced. A general distinction may be observed between Scotch T. and English T., the latter being generally close 'cropped' and finished as dress T., while the former have a somewhat rougher woolly surface. The manufacture of T. is now the most important department of the woollen industries, and it has spread from its original seat—which, however, continues to be its principal centre—to most of the districts engaged in woollen manufactures. In Aberdeen, at Bannockburn, at Alva near Stirling, and at Paisley, in Scotland, the industry is prominent; and in England, Leeds and other Yorkshire towns and the West of England woollen regions are also extensively devoted to the manufacture. See WOOLLEN MANUFACTURES.

Twelve Tables (Leges XII., Lex XII. tabularum) is the name given to the first codification of Roman law drawn up about the middle of the 5th c. B.C. According to the account given by the Roman writers (Livius bk. iv., Dionysius bk. x., Cicero de Rego ii., &c.), three commissioners were sent to Greece in B.C. 454, in accordance with a plebiscitum approved of by the Senate, to examine into the legal institutions of the various cities, and on their return ten men were elected in 451 by the Comitia Centuriata to draw up a code for Rome (decemviri Legibus scribundis), the other magistracies being for the time suspended. By the end of that year ten tables had been drawn up and confirmed, but as it was thought that more were required, Decemvirs were again elected for B.C. 450, and two tables were added to the collection, making in all twelve. These were then inscribed on bronze and set up in some public place; and whatever the meaning of the passage in *Livy* (vi. 1) about the burning of the city by the Gauls may be, it is evident that the copies of these laws extant in the time of Cicero were regarded by every one as unimpeachably genuine. The T. T. contained enactments bearing on both public and private law; and as regards both, it seems probable that they contained no new legislation, but merely embodied the customary law of the time, now first fixed by writing. On points with which Roman law had not hitherto dealt, there is no reason to doubt the truth of the tradition that Greek or other foreign sources were freely drawn upon. In course of time the Public law (Jus publicum) underwent great alterations, but the private law continued unchanged though somewhat amplified. Many commentaries were written upon the T. T., but the only one that is now extant is that by Gaius, fragments of which are contained in his *Digest*. See the remarks on the so-called Decemviral Legislation in the histories of Mommsen and Ihne, and Dirksen's *Uebersicht der Zwölf-Tafeln-Fragmente* (Leip. 1824), and Schott's edition (Leip. 1866).

Twes'ten, August Detlev Christian, a Protestant theologian, was born at Glückstadt, April 11, 1789, studied at Kiel, and was successively a teacher in the Berlin gymnasium, professor of theology at Kiel (from 1814), and professor at Berlin (from 1835) in room of Schleiermacher. He died January 8, 1876. His chief writings are *Vorlesungen über die Dogmatik der Evangelisch-Lutherischen Kirche* (vol. i. 1826; 4th ed. 1838; vol. ii. 1837), *Grundriss der Analytischen Logik* (Kiel 1834), *Matthias Flacius Illyricus* (Berl. 1876).

Twick'enham, a town of Middlesex, on the W. bank of the Thames, is 10 miles W.S.W. of Hyde Park Corner, and has three stations on the South-Western Railway. St. Mary's, with an ancient tower but red-brick nave rebuilt in last century, contains Pope's monument, erected by Bishop Warburton in 1761; and other churches are Holy Trinity (1840; reseated 1877) and St. Stephen's (1874-76). The public buildings include a handsome town-hall, a library and reading-room, the Royal Naval Female School (1856), and the Metropolitan and City of London Police Orphanage, to which a new wing was added in 1878. The site of Pope's famous villa is covered by modern residences, and Orleans House was converted (1877) into a club; but Strawberry Hill, which its builder, Horace Walpole, pronounced 'the prettiest bauble, set in enamelled meadows with filigree hedges,' remains for a monument of Gothic in the 17th c. Pop. (1801) 3138, (1871) 10,533, an increase due to the number of new villas, which, reaching to Richmond Bridge, constitute T. a suburb of Richmond (q. v.). See the Rev. R. S. Cobbett, *Memorials of T.* (Lond. 1872).

Twill, or **Tweel**, is that system of plain weaving in which the weft rises above one and shoots under two or more of the warp threads in regular succession. Twilled fabrics have therefore always a diagonal appearance.

Twi'light (Old Eng. *twy* or *twi*, 'double,' and *leoht*, 'light'), the interval of dusk which before sunrise and after sunset divides the day from the night. The word used without qualification is usually understood as applying to evening T. (Lowl. Sc. the *gloaming* = the glooming), while morning T. is distinguished as the *dawn*. The phenomenon is caused by the reflection of light from the atmosphere. The quantity reflected, and therefore the intensity of the T., at any instant depends primarily upon the distance of the sun below the horizon of the observer. The greater this distance the fainter the T., until when the sun has reached a certain limiting distance the T. ceases. This limit has been variously fixed at from 15° to 24° by different observers, the discrepancy being mainly due, no doubt, to the impossibility of noting the instant at which such a gradually diminishing or increasing luminosity ceases or begins, and also to the varying atmospheric conditions under which the observations were made. The limit usually assigned is 18°; that is to say, when the sun is 18° below the horizon, T. has ceased or has just begun. When the sun passes through the zenith of the observer, its path is a great circle cutting the horizon at right angles. In such circumstances, which are peculiar to the tropical regions, the duration of T. is at its minimum, since the sun sooner reaches the limiting distance than when its path is a great circle cutting the horizon obliquely. The duration of T. is of course much influenced by such local conditions as clouds, smoke, mist, &c., which diminish to a marked extent the intensity of daylight.

Tybee', an island at the mouth of the Savannah river, Georgia, U.S. It is 6 miles long and 3 broad, and at its N.E. end stands the large T. lighthouse. Great batteries were erected here by General Gillmore in 1862.

Ty'burn, till 1783 the site of the London gallows, where Catholic priests were martyred by Elizabeth, and Felton, Jack Sheppard, Dr. Dodd, and other notable offenders, paid for their crimes. It was situated at the W. end of T. Road (now Oxford Street), near the Marble Arch, and its name survives in the N.W. suburb, 'the elegant, the prosperous, the polite Tyburnia.'

Tycoon' (Chinese 'great lord'), or more correctly Shiogun, the title of the hereditary military despots who ruled Japan from 1192 to 1868, when the revolt of the Daimios swept away the last of the race and reinstated the Mikado in power. The T., who resided at Yeddo, did homage to the *roi-fainéant* at Miako, but ruled unrestrictedly. Hence Europeans carried away the impression that the T. was the real emperor and the Mikado a 'spiritual ruler.'

Tye, Christopher, Doctor of Music, was born in London about 1500, and educated in the Royal Chapel, of which he ultimately became organist, and for which he produced many services, anthems, and other sacred compositions. These works, though now obsolete, were for many years of great repute among musicians. An excellent example of his style is to be found in the anthem for four voices, 'I will exalt thee, O Lord!' in the second volume of Dr. Boyce's *Collection of Cathedral Music*. He translated the first fourteen chapters of the Acts of the Apostles into metre, and set them to elaborate music. T., who was musical instructor to the children of Henry VIII., received the degree of Doctor of Music at Cambridge in 1545, and died about 1580.

Tyldes'ley, a growing town of Lancashire, England, 10 miles N.W. of Manchester. It has a church and several chapels,

There are large collieries in the neighbourhood, and cotton-spinning is the chief industry of the town. Pop. (1871) 6408.

Ty'ler Insurrec'tion, a popular revolt during the minority of Richard II., which was headed by Wat Tyler, a soldier who had served in the French wars, and Jack Straw, an Essex peasant. Its immediate occasion was the imposition in 1381 of a poll-tax of 3 groats on every adult, to defray the cost of the disastrous French war; and the first blow struck was the death of a tax-gatherer, who had offered an insult to the daughter of a black-smith in Essex. From Essex the revolt spread over Norfolk, Suffolk, Sussex, and Surrey, but its strength lay in the 100,000 men of Kent, who marched on London, passing quaint rhymes from man to man, and putting to death every lawyer whom they found. The nobles fled, paralysed with fear, while the artisans of London flung open the gates of the city. Soon the stately palace of John of Gaunt at the Savoy, the new inn of the lawyers at the Temple, and the houses of the foreign ambassadors were in flames, while a band under Tyler himself broke into the Tower and dragged out and put to death Archbishop Sudbury, the Prior of St. John, and the treasurer and chief commissioner in the levy of the hated poll-tax. At Mile-End, without the city, the young king met the great mass of the peasants, whom he overawed by his fearless demeanour, and induced them to disperse by promising them charters of freedom and amnesty. However, 30,000 remained with Wat Tyler to watch over the fulfilment of the royal pledge, and this body Richard met by chance next morning at Smithfield. In the conference which ensued, William Walworth, the Mayor of London, exasperated at the insolence of T., stabbed him with his dagger, and in the scene of confusion which ensued, the king, with great presence of mind, addressed the populace, led them to Islington, and commanded them to disperse. The death of Tyler paralyzed the people, while it revived the courage of the nobility. The king, in violation of his pledge, led an army of 40 000 men through Kent and Essex, and spread terror by the severity of his executions, while in Norfolk and Suffolk the revolt was stamped out with the most ruthless cruelty. See C. E. Maurice, *Lives of Tyler, Ball, and Oldcastle* (Lond. 1872).

Tyler, John, the tenth President of the United States, was born in Charles City county, Virginia, March 29, 1790. He graduated at William and Mary College in 1806, was admitted to the bar in 1809, was a member of the State Legislature 1811-16, and 1823-25, and entered Congress in 1816. In 1825 he was elected governor of Virginia, and from 1827 to 1836 he represented that state in the Senate. In 1840 he was unanimously elected Vice-President by the Republican party, and on the death of Harrison, a month after his election, he became President of the United States. He now disappointed the expectation of his party, and rendered himself very unpopular, by opposing the bill for the erection of a national bank, and by a revival of the Presidential right of veto. The principal event in his administration was the annexation of Texas, March 1, 1845. On the expiry of his term of office he retired into private life until February 1861, when he was president of the abortive 'peace convention' at Washington. On the outbreak of the war he renounced his allegiance to the United States, and was elected to the Confederate Congress, but died at Richmond, January 17, 1862.

Tyloph'ora (*tylos*, 'a swelling,' and *phoreō*, 'to bear,' alluding to the swollen pollen-masses) is a considerable genus of *Asclepiadaceæ*, found in various tropical and warm regions of the Old World. *T. asthmatica*, a native of the E. Indies, is the most important species. Its leaves have emetic, expectorant, and diaphoretic properties, and form one of the best substitutes in India for ipecacuanha. The root has also medicinal properties. The stem yields a strong, white, silky fibre.

Tym'panum. See EAR.

Tyn'dale, William, an English reformer, memorable for his translation of the Bible into his mother tongue, was born between 1480 and 1490, probably at the manor of Hurst, near Slymbridge. After finishing his education at the universities of Oxford and Cambridge, he lived for some time as tutor in the family of Sir John Walsh, at Little Sudbury in Gloucestershire, undertaking preaching tours in the neighbouring villages, to maintain theological discussions with the local clergy, and to try his 'prentice hand as a translator on the *Enchiridion militis Christiani* of Erasmus. Meanwhile his attention had been turned to the need of a translation of the Scriptures into the vulgar tongue; and in hopes that he would procure the assistance of the Bishop of London, he departed for the capital with an oration of Isocrates done into English as proof of his capabilities. His expectation of episcopal co-operation was cruelly disappointed; and soon after (May 1524) he departed for the Continent, to prosecute his great task at his own expense and hazard. His first destination was Hamburg, but he probably proceeded to Wittemburg to see Luther. By 1525 he had begun to print his New Testament at Quantel's press in Koln; but he had only got as far as signature K when the printers were ordered by the magistrates to stop, and T. and his assistant Roye were glad to escape with such sheets as they could hurriedly seize. At Worms, to which they fled, the work was taken up by Schœffer, and before the close of 1526 two editions of the New Testament seem to have been ready for the market. Of the quarto edition only a single and imperfect copy is known to exist, and of the octavo there are no more than two. The version was based on the Greek, and controlled so far by the Vulgate and Lutheran translations. In 1527 T. removed to Marburg, and there he published through Hans Luft *The Parable of the Wicked Mammon* (1528), *i.e*, of the Unjust Steward, being a treatise on justification by faith, a work on *The Obedience of a Christian Man, and How a Christian Ruler Ought to Govern* (1528), a translation of the Pentateuch (1530), a treatise, or, according to one account, three treatises, on matrimony, and *The Practice of Prelates*. This last work, which boldly attacked the clerical abuses of the time, was in part an answer to Sir Thomas More's famous *Dialogue* (1529), in which the Catholic positions were defended with consummate skill. About 1531, Cromwell, who was then in power, was anxious to get T. to return to England, and employed Stephen Vaughan, envoy to the Low Countries, to persuade him; but T. was too wary to risk his neck under such a king as Henry VIII. Great efforts were made to entrap him, and Elyot, the envoy who replaced Vaughan, was commissioned to search him out. But T. successfully eluded the royal emissary, sometimes moving from place to place, sometimes quietly working at Antwerp. About 1532 he published a translation of the Book of Jonah and an Exposition of the Sermon on the Mount; and at length in 1534 he was able to bring out a revision of his New Testament. Of this edition, printed at Antwerp by Lempereur, only one copy, that of the Grenville Library in the British Museum, is known to exist. It was a great improvement on its predecessor. On the 23d or 24th May 1535 T. was arrested at Antwerp by the representatives of the Emperor Karl V., and conveyed a prisoner to the Castle of Vilvorde. In 1536 the reformer was formally arraigned before an imperial commission, sentence of death was pronounced on 10th of August, and on Friday 6th October he was strangled by the public executioner, and his body burned to ashes. His last words were, 'Lord, open the King of England's eyes.' Both the king and Cromwell had made some efforts to save him. T. was a man of rare sincerity of purpose and simplicity of life. He was well versed in Greek and Hebrew, had no small power of argument, and, what more than all else fitted him for his task, he was master of an English style which for unconstrained strength and natural dignity has never been surpassed. To him the literary beauty of our English version is mainly due. An almost complete edition of T.'s works was prepared for the Parker Society by Dr. Walter (1848 and *et seq.*). Mr. Arber has published a photolithographic copy of the first quarto New Testament; and Mr. Fry has produced fac-similes of the complete octavo preserved in Bristol, &c. See Anderson's *Annals of the English Bible* (1845), Westcott's *History of the English Bible* (1868), Demaus' *Life of T.* (1871), Eadie's *History of the English Bible* (1876), and *Athenæum*, 1877 and 1878.

Tyn'dall, John, D.C.L., LL.D., F.R.S., a distinguished scientist, was born at Leighton Bridge, near Carlow, Ireland, August 21, 1820. In 1839 he acted as civil assistant to a division of the Irish ordnance survey, was then transferred to the English branch, which he quitted in 1844, and filled the position of a railway engineer for the next three years. In 1847-48, as teacher of physics in Queenswood College, Hampshire, he met Dr. Frankland the chemist, with whom he visited Germany.

At Marburg he attended the lectures of Bunsen, Gerling, Knoblauch, and Stegmann; and in the physical laboratory of Knoblauch made important researches into the magneto-optic properties of crystals, published in the *Philosophical Magazine* in 1850. Soon after his return home he was elected a fellow of the Royal Society, and in 1853 was appointed professor of natural philosophy at the Royal Institution, of which he became superintendent in 1867. In 1872 he made a lecturing tour through the United States, and placed the profits (nearly £3000) in the hands of an American committee for aiding students 'who devote themselves to original research.' In 1874, as President of the British Association, he delivered an address which roused much controversy by reason of its avowed materialistic sympathies. Besides his discoveries in magnetism and diamagnetism, his principal original researches are those on radiation (1859), which formed the subject of his 'Rede Lecture' in 1865, and on the acoustic properties of the atmosphere (1874). His great reputation rests upon his peculiar ability as a popular exponent of physical science, in which as an eloquent and lucid lecturer he occupies a wholly unique position. As an Alpine traveller he has had much experience, and his observations have fully corroborated the earlier results of Forbes relating to glacier motion, though his theory cannot be accepted as a complete scientific explanation of the phenomena. (See GLACIERS.) His own Alpine experiences are recorded in *The Glaciers of the Alps* (1860), *Mountaineering* (1861), *A Vacation Tour* (1862), and *Hours of Exercise in the Alps* (1870). He has published also a number of popular scientific works, remarkable for their clear and eloquent English, but not equally remarkable for their scientific accuracy. Of these the best known are *Heat considered as a Mode of Motion* (1863), *Sound* (1867, 3d ed. 1875), *Researches in Diamagnetism and Crystalline Action* (1870), *Notes on Electricity* (1870), *Notes on Light* (1871), *Essays on the Use and Limit of the Imagination in Science* (1871), *Fragments of Science for Unscientific People* (1871, new ed. 1876), *The Forms of Water* (1872), *Contributions to Molecular Science in the Domain of Radiant Heat* (1872). He is also author of a semi-biographical work entitled *Faraday as a Discoverer* (1868). In 1876 T. married Louisa, eldest daughter of Lord and Lady Claud Hamilton, and niece of Lord Abercorn.

Tyne, an important river in the north of England, is formed 2 miles above Hexham by the confluence of the North T. and South T., the former rising in the Cheviots on the Scottish border, 11 miles S.E. of Hawick, and traversing Keelder Moor, the latter springing from Cross Fell in Westmoreland, 11 miles N. of Appleby. The basins of both head-streams are pregnant with Border reminiscence, and are dotted with old castles and modern seats. The Reed, a feeder of the North T., has its source on Carter Fell, and flows past Otterburn; the chief branch of the South T. is the Allen, which joins it below Haltwhistle. From Hexham the T. flows E. through a richly-wooded, highly-cultivated country, passing Corbridge, Ovingham, Newburn, Ryton, Blaydon, Newcastle, and Gateshead, Walker, Jarrow, and N. and S. Shields, entering the North Sea at Tynemouth after a course of 80 miles. Above Ryton it becomes the boundary between Northumberland and Durham, and below it receives its chief affluents the Derwent and Team. The T. is navigable to Blaydon for small craft, and is crossed by many remarkable bridges. It is chiefly important as the channel of the great Newcastle coal trade, but is also the most productive of the English salmon rivers. The recent use of hang-nets at the mouth reduced the yield from 129,000 fish in 1872 to 21,746 in 1874, but certain restrictions having been placed by the conservators on net-fishing, the catch rose to 23,290 in 1875, to 24,840 in 1876, and to 41,200 in 1877.

Tyne'mouth, a watering-place of Northumberland immediately E. of N. Shields (q. v.), and 8 miles E. of Newcastle. It is an excellent bathing place, with fine sands. The new solid stone pier which shelters the mouth of the Tyne is one of the largest works of the kind ever erected in England by private enterprise. An aquarium, second only to that of Brighton, was opened in 1878. It cost £100,000. The ward or township of T. had a pop. (1871) of 21,908, but this includes much more than the village of T.

Type (Gr. *typos*, orig. 'a blow') in the New Testament means (1) a mark, as from a blow (John xx. 25); (2) a copy or image (Acts vii. 43); (3) a mould (Rom. vi. 17); (4) a model (Acts. vii. 44, Heb. viii. 5); and (5) an example (Phil. iii. 17). In theology, T. means 'some object, whether office, institution, person, or action, by means of which some truth connected with Christianity was pre-figuratively foretold under preceding dispensations.' Such an object, which in the New Testament is called a shadow (*cf.* Heb. x. i), became a T. 'because it presented the model, or representation, of something yet future.' See Fairbairn's *Typology of Scripture* (2 vols. 1870).

Types. The development of the modern atomic theory in chemistry has led to the recognition of resemblances in the constitution of different compounds and in the manner in which they react with other agents in giving rise to new products, which are likewise capable of similar comparison. Such substances are said to be modelled upon the same type; and it is found that all known bodies can be so classified in a certain limited number of groups, according to their constitution and modes of transformation. For instance, water (HOH) is capable of exchanging its oxygen and hydrogen for equivalents of other elements and groups of elements, and the resulting compounds, retaining more or less perfectly the same chemical constitution and deportment, are said to belong to the water-type. Such are sulphuretted hydrogen (HSH), caustic potash (KOH), caustic soda (NaOH), hypochlorous acid (ClOH), common alcohol (C_2H_5OH), and indeed all the alcohols. Water itself may be regarded as belonging to the hydrochloric acid type (HCl), the chlorine being replaced by the radical hydroxyl (OH); while hydrochloric acid may be referred to the hydrogen type, the simplest form of all T. (HH). Ammonia and marsh gas are also often referred to as T.; and indeed it is obvious that for special purposes any list of bodies may be chosen as T., to which all others may be referred. The regularity with which natural laws work leads us to expect a certain uniformity in combination; and perhaps when the decomposition of the elements, already rendered highly probable by the spectroscopic researches of Lockyer, has been more fully studied, simpler and more general T. may offer themselves to the theoretical chemist. Meanwhile, analogy should not be carried too far; and reasoning from type relations must ever be conducted with caution.

Types and Type'-founding. In the article Printing (q. v.) it has been shown that the early printers were generally their own typefounders, but how they did this is matter of conjecture. It is thought, however, that at first their types were cut in wood or soft metal, and that with the pattern thus cut they formed moulds in sand or other suitable material, from which they cast their types. Schœffer is believed to have been the first to devise the matrix, on very much the same principle in which it now exists. The earliest notice of typefounding in Britain is found in Archbishop Parker's preface to the *Chronicles of King Alfred*, printed in 1567 by John Daye, which states that printer to have been the first to cast Saxon types in England, though it is far from probable he was the first typefounder in the country. A decree of the Star Chamber in 1637 shows that at this date the process had become a distinct trade, as the decree limited the number of founders to four. From early times till the present century, the matrix and hand-mould of Schœffer received but slight improvement, consisting chiefly in the addition of a small lever which enabled the work to be more rapidly performed, and this matrix is still partially in use. The metal used is a compound of lead, tin, and antimony, the proportions varying with each particular founder. There are many varieties and sizes of type, but those generally in use for book-work, graduating downwards, are—English (1), Pica (2), Small Pica (3), Long Primer (4), Bourgeois (5), Brevier (6), Minion (7), Emerald (8), Nonpareil (9), Ruby (10), Pearl (11), Diamond (12), and Brilliant (13)—the latter six being seldom used but for Bibles and Prayer-Books, or as footnotes to the larger sizes. Their proportions will be better seen from the following:—

a	a	a	a	a	a	a	a	a	a	a	a	a
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

Pica is the standard of measurement used by printers, and is nearly one-eighth of an inch in width—nonpareil is half pica. An assortment of types of one kind is termed a Fount, to which a proportionate amount of each separate letter is given, according

to its frequency in use—thus of *e* will be given three times the quantity of *d*; of *a*, *i*, *o*, and *s*, two-thirds of *e*; of *r* one-half; of *u* one-fourth; of *v* one-tenth, of *z* one-sixtieth, and so on. Having determined the style of letter to be cast, the first operation is the cutting of the punch or die, which is done on softened steel. The cutter having satisfied himself that the letter is nearly perfect, smokes it in a lighted candle, and by an impression on paper sees where any little improvement can be made, either by a corner to be rounded off, or a round to be sharpened. The punch is next hardened and tempered, when an operator termed the 'justifier' strikes it into a piece of copper the required size, and from this 'strike' produces a finished matrix, which he so trims and 'justifies' that when placed in the mould the types cast from it shall be regular in height and appearance with all the other types produced from the punches belonging to the same fount, there being in all upwards of 350 different punches and corresponding types in one complete fount of roman and italic. This process involves considerable labour and nice technical skill. The mould into which the matrix is put is made of steel enclosed within a wooden shell composed of two halves, and adjustable to a thick and thin letter of the same fount. The matrix is firmly held in its place by a strong spring, the two halves of the mould being tied together by string, while at the top is a small opening into which the metal is poured. As the metal is run into the orifice by a small, toy-looking ladle, the mould is jerked upwards by the workman, which serves to throw the metal down into the matrix, and gives a firm, solid face to the type, assisted in this by what is known as the 'break,' a useless tag of metal which adheres to the type at the opening where the metal is poured in. The spring is then loosened, and the type drops out. This process is done with great rapidity, averaging from 600 to 800 per hour, according to the size of the type. As they leave the mould, the types are taken up by a boy, who breaks off the tag, and they are then taken by the 'rubber,' who passes them up and down a file till they are quite smooth. They are next set up in a long line on sticks about a yard long, and passed to the 'dresser,' who turns the types face downwards in blocks prepared for the purpose, and with a small plane cuts a groove in the feet of the types, removing in this way any unevenness, and enabling them to stand properly. Notches or nicks are also ploughed on the front of the type, so as to show the compositor how to place them when setting up. These nicks vary in all founts, no two founts having the same nick or series of nicks. Taken out of the blocks, a file is lightly passed along the back and front; a few types are then removed from the ends and middle of the line, and tested by various standards of steel for body, for height, and for evenness of appearance. After examination of the face through a magnifying glass, when any defective letters are thrown out, the types are finally passed as correct, and are then put into pages of separate letters ready for the printers. Letters which overlap their neighbours, such as *f* and *j*, are dressed on a specially prepared file, as the same treatment as the others would remove a portion of the letter. Types of large size with fine lines are turned out by a method of pump-casting, invented by Mr. David Bruce of New York in 1834—the ladle in this process being superseded by a small pump placed in the metal-pot, to the mouth of which the mould is held; the handle of the pump is jerked downwards, which forces the metal with considerable power into the matrix, and gives a good face, but not nearly so solid as by hand-casting. From this pump process was developed the type-casting machine, also by Mr. Bruce, and first introduced into Great Britain by Messrs. Millar & Richard of Edinburgh, who also improved upon it. With this machine the opening and closing of the mould, the advancing of the nipple of the pump, and the jerking of the handle, are done automatically—the matrix being, as in hand-casting, held in its place by the spring. On the return of the mould from the pump, it opens and lets fall a type with break attached, and it is then dressed in the usual way. Types are cast by this machine at the rate of from 100 to 120 per minute. The latest improvements upon this have been the work of Messrs. Johnson & Atkinson, by whose machine the type is not only cast, but also rubbed, dressed, and rendered almost fit for immediate use by the printer. Attempts have been made to produce types by casting several at once, like combs, of which the separate letters would form the teeth, but that nicety and accuracy which is necessary was not attainable.

Ty'pha (Gr. 'a fern') is the typical genus of *Typhaceæ*, an order of marsh or aquatic herbs with creeping root-stock, narrow linear leaves, and monœcious flowers in cylindrical spikes or heads. T., or the reed-mace, or cat's tail, and locally the bulrush—is distinguished from *Sparganium* (or bur-reed), the only other genus, by having the flowers arranged in cylindric spikes instead of globose heads. *T.* includes eight species distributed through various temperate and tropical countries. Of these *T. latifolia* and *T. angustifolia* occur in Britain by the sides of lakes, pools, rivers, and water-courses. The rootstocks have been used as food in times of scarcity, and the copious pollen is made into bread in parts of India and New Zealand.


Typha latifolia.

Ty'phon, the Greek name of the Egyptian deity Set, brother and destroyer of Osiris, who, worshipped as early at least as the sixth dynasty, came afterwards to be looked upon as an embodiment of the principle of evil. In Greek mythology T. or Typhoeus was one of the giants whom Zeus, having vanquished, placed beneath Mount Ætna.

Typhoon' (Chinese *tei-fun*, 'hot wind'), the name given to the violent hurricanes which rage on the coasts of Japan and China and the neighbouring archipelago. They occur from May to November, but especially in July, August, and September, travelling generally from E.N.E. to W.S.W. along the coast of China. In their broad characteristics they resemble hurricanes in other parts of the world, and their tremendous fury is no doubt due very much to the surface conditions under which they are produced. See WINDS.

Ty'phus Fever has been known under a number of synonyms, such as *Spotted Fever*, *Epidemic* or *Contagious Fever*, *Putrid* or *Malignant Fever*, *Camp* or *Jail Fever*, *Ship Fever*, *Petechial Typhus*, *Brain Fever*, *Irish Ague*, &c. The symptoms are thus described by Dr. Murchison: 'There is more or less sudden invasion, marked by rigors or chilliness, frequent compressible pulse, tongue furred and ultimately dry and brown, bowels in most cases constipated, skin warm and dry, a rubeoloid rash appearing between the fourth and seventh days, the spots never appearing in successive crops, at first slightly elevated and disappearing on pressure, but after the second day persistent and often becoming converted into true petechiæ, great and early prostration, heavy flushed countenance, injected conjunctivæ, wakefulness and obtuseness of the mental faculties, followed at the end of the first week by delirium, which is sometimes acute and noisy, but oftener low and wandering, tendency to stupor and coma, tremor, subsultus, and involuntary evacuations with contracted pupils. Duration of the fever from ten to twenty-one days, usually fourteen. In the dead no specific lesion, but hyperæmia of all the internal organs, softening and disintegration of the heart and voluntary muscles, hypostatic congestion of the lungs, atrophy of the brain, and œdema of the pia-mater, are common.' The phenomena of T. F. depend upon the absorption into the system of a specific poison, and the period of incubation is from one to twelve days. Should a fatal termination ensue, it usually happens between the twelfth and twentieth day of the fever, death being preceded by great prostration, involuntary evacuations, and coma. The mortality is about one in five of those attacked, and the greater the age above ten years the greater the danger.

T. F. is distinguished from any inflammatory condition of the lungs by the peculiar rash and the nature of the fever, from acute meningitis by the peculiar rash and the absence of nausea, vomiting, and delirium, almost from the commencement, which characterise meningitis. Professor Charteris draws the following distinctions between T. F. and Typhoid or Enteric Fever (q. v.). '(1) In T. F. the rash is mulberry, mottled, and continuous, going on to ecchymosis, and hence resisting pressure; in typhoid the rash consists of rose-coloured spots, fading in three

days, and giving place to a fresh crop: these spots disappear on pressure, and are not surrounded by mottled skin. (2) In T. F. the rash appears from the fifth to the eighth day; in typhoid fever between the seventh and the fourteenth. (3) In T. F. there is no diarrhœa; in typhoid, diarrhœa is common, and the stools are of a peasoup colour. (4) In T. F. the symptoms are generally cerebral, hence disquietude going on to coma, with an intermediate stage of delirium; in typhoid the symptoms are abdominal, hence diarrhœa and pain on pressure over the right iliac fossa. In T. F. we see contracted pupils, mutterings, delirium preceded by disquietude and uneasy manner, and congested conjunctivæ; in typhoid we see dilated pupils, delirium preceded by apathy and somnolence, and no congestion of the conjunctivæ. (5) These fevers also differ in their duration, a crisis being reached in T. F. on the fourteenth day of the fever; while in typhoid not a crisis but a lysis is reached on the twenty-first day. T. F. may occur at any age, and is commonest among the poor. Typhoid is generally a disease of youth or of adult life, is rare after forty, and it shows no partiality to the poor.'

T. F. was one of the early pestilences and plagues; and under the term Typhus the writer of one of the Hippocratic treatises describes a disease resembling typhoid fever. Sauvages, in his *Nosology*, was the first to use the term in designating certain forms of continued fever. It has generally prevailed as an epidemic where insanitary conditions, overcrowding, and famine have prevailed. In 1487 Ferdinand lost 17,000 of his soldiers from T. F.; and, in 1552, Karl V. lost a large number of his men at the siege of Metz. In 1566 T. F. appeared in the army of Maximilian II., and spread over the whole of Europe. During the Thirty Years' War it was prevalent in Central Europe, and the Bavarian army lost in Bohemia 20,000 men. In the wars of Louis XIV., Friedrich the Great, Napoleon I., and lastly, in the Crimean War, it prevailed to an alarming extent. In former times T. F. was exceedingly common in the prisons of Europe, and was called *jail fever* or *distemper*. It is supposed to have been the disease communicated from the prisoners at the Black Assizes; and so late as 1815 in Dublin, 1839 at Rheims, and 1854 at Strassburg, it was present in the prisons. Ireland has been peculiarly subject to epidemics of T. F., probably from the predisposing influence of privation, the principal epidemics having occurred in 1708, 1718, 1729, 1735, 1740, 1770, 1797, 1803, 1817, 1826, and 1846. The epidemic of 1740 in Ireland, together with famine, is said to have destroyed 80,000 people; that of 1846 was still more destructive, and raged over the whole British Islands for two years. 300,000 cases were said to have occurred in England, 19,254 in Scotland, and 1,000,000 cases in Ireland, in 1847. In Liverpool alone 10,000 cases were said to have occurred, the chief force of the epidemic having fallen upon the overcrowded lodging-houses. The last considerable epidemic in England, in 1862-69, was of a partial character, its principal seat being in London.

The chief, if not the only, exciting cause of T. F. is the specific poison of the disease transmitted from person to person by contagion or fomites; but it can also be communicated apart from actual intercourse with the sick by the use of articles of bedding and clothing that have been used by patients suffering from the disease, or by residence in a house where the fever has recently existed. Dr. Buchanan states, as the result of his experience at the London Fever Hospital, that 'nurses in hospitals, where many cases of T. F. are received, invariably get T. F., no matter under what sanitary conditions they are placed. There appears to be no exception to this rule, unless, indeed, it be that the nurse is insusceptible of the disease from a previous attack of it. Medical men and Catholic priests in attendance upon numerous T. F. cases are also almost sure, sooner or later, to get T. F., and that they do not fall ill with so much certainty and rapidity as the nurses, appears due only to their contact with the sick being less constant and intimate. The contagious matter of the disease seems peculiarly capable of destruction when it is diluted with air. Thus, tolerably close communication with the body of a T. F. patient appears requisite for the reception of contagion from him. Casual visitors to fever wards very seldom get T. F., and in private houses of the better class the disease rarely spreads to the attendants. Extension of T. F. from an hospital to the adjacent streets is unknown, even though there should be hundreds of cases congregated within a very short distance of other buildings.'

T. F., like other diseases of its class, cannot be cured, in the strict sense of the term, nor can its duration be shortened by any means at present known to medical science. The only treatment consists in supporting the strength through the course of the fever, and combating symptoms and complications as they appear while the curative processes of nature are going on. The nutriment given should be such as requires the simplest processes for its assimilation, such as beef-tea, broths, milk, eggs, and, in certain cases and stages of the disease, alcoholic stimulants. A little only should be given at once, but it should be given frequently—every two or three hours; and if the patient be in a drowsy state, he should be roused up to take his nourishment. Lemonade, soda-water, and cold weak tea without sugar or milk, may be given for drinks. The cases in which alcoholic stimulants are serviceable are, '(1) in old people almost universally; (2) cases of great prostration, with low delirium and coma; (3) cases where the pulse is very compressible, and the first sound of the heart feeble, also when the pulse intermits, and usually when it exceeds 120 in frequency; (4) cases where the extremities are cold and the surface is livid; (5) where there is much congestion of the lungs; (6) where there is any erysipelatous complication' (*Buchanan*). Stimulants are contra-indicated in the majority of cases, and even in severe cases where there is violent maniacal excitement; but they are useful when the patient is approaching the crisis of the disease, in the second or third week. Combating symptoms depends, of course, on the nature and intensity of the symptoms and complications, so that during the course of the disease it may be necessary to treat the patient for delirium, constipation, diarrhœa, bronchitis, pneumonia, retention of urine, swelling and suppuration of the salivary glands, erysipelas, &c. Cold baths at about 65° F. have been strongly recommended lately, and they may be repeated, day and night, when the temperature rises above 102° F. Patients should be removed from close, crowded rooms to a properly constructed hospital. Quiet, cleanliness, frequent sponging, and change of position, to avoid congestion of the lungs and bed-sores, are necessary, but above all there should be an ample supply of fresh air of even temperature, and the attention of an experienced nurse.

The prevention of the spread of the disease is a matter of great public importance, and this is best attained by free ventilation, for, even without disinfectants, free dilution destroys the poison or renders it inert. The breath and cutaneous exhalations of the patient being the principal vehicles of infection, the patient should be placed in the highest room of a house or hospital. The body should be anointed with olive-oil mixed with a little carbolic acid, and the excreta should be disinfected with a solution of sulphate of iron. After recovery or death, the room should be fumigated with nitrous-acid fumes, and the bedding and clothes should be burned, or thoroughly baked and washed. See Ziemssen's *Cyclopædia of the Practice of Medicine* (vol. i. 1874), Reynolds' *System of Medicine* (vol. i.), *A Treatise on Continued Fevers*, by Dr. Murchison (Lond. 1873).

Tyr (Old Eng. *Tiw*, O. H. G. *Ziu*), in the northern mythology a son of Odin and Frigg, is the god of war and the sword. He alone of all the Æsir had the courage to bind the ferocious Fenrir-wolf, in doing which he lost his own hand. In the 'twilight of the Æsir' he fights with the hell-hound Garmr, and both are slain. See TUESDAY.

Ty'rant (Gr. *tyrannos*, prob. connected with *kurios*, 'lord') originally meant among the Greeks one who had usurped power at the expense of the existing forms of government. Most of the Greek states were close oligarchies, and it frequently happened that some one member of the aristocracy would succeed either by means of foreign mercenaries or by allying himself with a popular party in ousting the government of the day and setting himself at the head of the state. Such a ruler was of necessity distasteful to the nobles, but might be acceptable to the body of the people; nor did the irresponsibility of his position necessarily lead him to prejudice his popularity by acts of oppression or violence. The 'tyranny' of Peisistratos was mild, humane, and beneficent. The *Thirty Tyrants* is the name given to the government set up by Sparta in Athens at the end of the Peloponnesian War, B.C. 404. See besides the histories of Greece, Plasz, *Die Tyrannen* (Bremen 1852).

Ty'rant Shrike', King Bird, or Ty'rant Fly'catcher, the *Tyrannus intrepidus* of ornithologists, is an *Insessorial* bird,

named from its bold and wary habits, and from its pugnacious disposition. It is found in America, attains a length of 8 inches, and is black and ashen grey above, and white below, a grey patch occurring on the breast. From the golden feathers of its crest, it has been named the 'King Bird.' Its food consists of insects and berries. The T. S. is of migratory habits, and arrives in the United States in April.

Tyrconn'el, Richard Talbot, Earl of, born in Ireland in 1625, was in early life noted for his unscrupulous character, came to England at the Restoration, but was banished in 1677 for a conspiracy against Charles II. He was created by James II., on his accession, Earl of T., and was in 1686 made commander of the forces in Ireland. In January 1687 he succeeded Clarendon as Lord-Lieutenant, when he commenced a policy which in a few months completely overthrew the English ascendancy, every Protestant judge and magistrate being replaced by an Irish Catholic, and the army being completely purged of its Protestant officers and men, while several new regiments were formed of the most ignorant and bigoted recruits. When the Revolution took place, T., to gain time for maturing his plans, intrigued with William for two months, but at the beginning of 1689 hoisted a flag, embroidered with the words 'Now or Never,' from Dublin Castle, and in a short time had an army of 50,000 men. After the defeat on the Boyne, T. went to France, returned with French forces in the spring of 1691, but died at Limerick, July 14th, 1691. T. was married to Frances Jennings, a sister of the famous Duchess of Marlborough. His name was execrated in England, and is celebrated in the famous contemporary doggrel ballad *Lilli Burlero*, which 'whistled a deluded prince out of three kingdoms.'

Tyre (Heb. *Sôr*), the most powerful and, with the exception of Zidon, the most celebrated city of Phœnicia, was built partly on the mainland and partly on an island 33 miles N.N.E. of Carmel and about 47 S.W. of the modern Beirût. T. first appears in history as the kingdom of Hiram the friend of David and Solomon (10th c. B.C.), by whom the island is said to have been first occupied and united with the mainland by moles nearly 4000 feet long, forming a spacious and secure harbour. As this island was only some 22 stadia in circumference, the houses were built unusually high—five or six stories; the most important building was a temple of Melkart. From the time of Hiram T. increased rapidly in importance, trading not only with the Mediterranean countries, but even with Britain and Gaul, exporting largely home manufactures, especially the celebrated Tyrian purple. T. endured several severe sieges, in which the island frequently held out long after the reduction of the part situated on the mainland, from Salmanassar (8th c. B.C.) for five years; Nebuchadnezzar (580 B.C.) for thirteen years, and unsuccessfully as regards the island; from Alexander the Great (332) for seven months by land and sea; from Antigonus (314) for fourteen months. Notwithstanding these repeated disasters, the unusually favourable position of T. enabled it to recover itself with surprising rapidity, and under the Romans it was a place of wealth and importance, and continued a formidable stronghold down to the time of the Crusades. Taken by the Saracens in 1191 A.D., T. rapidly sank, and the opening of the sea route to India gave the final blow to its greatness. The causeway constructed by Alexander in his siege has almost completely silted up the harbour, so that what was formerly an island is now a peninsula. The modern Sûr has about 5000 inhabitants, of whom half are Christians. The only interesting building remaining is the *Crusaders' Church* of the 12th c.

Tyr'nau (Hungar. *Nagy-Szombat*), a town in the comitat of Pressburg, Hungary, on the Trnawa, 28 miles N.E. of Pressburg by rail. It has a cathedral founded in 1389, and many other churches. Boulevards surround the town. There are cloth, linen, and sugar manufactures, as well as trade in agricultural produce and wine. A university founded here in 1635 was transferred to Pesth in 1784. T. has a great vat, larger than that of Heidelberg, and holding 27,000 gallons. Pop. (1869) 9737.

Tyr'ol (properly *Tirol*), the most westerly crown-land of Austria, is bounded N. by Bavaria, S. by Italy, W. by Switzerland and Lichtenstein, and E. by the crown-lands of Salzburg and Carinthia. Area, with Vorarlberg, 11,323 sq. miles; pop. (1870) 885,789. T. is a singular survival of an ancient type among the discordant elements of modern Europe. The people of the Zillerthal, the typical Tirolese, are pre-eminently distinguished by their national music, their deep attachment to their old religion, their picturesque costumes, and their passion for athletic exercises. Geographically T. resembles Switzerland; it is traversed by the N., Central, and S. Alps, and is divided mainly into three valleys, two of which, watered by the Inn and the upper streams of the Adige or Etsch, run from E. to W., while the third trends in a S. direction and forms a course for the main stream of the Adige. Outlying portions are the Vorarlberg, a district on Lake Constance, and the Leinz district on the Drave. The highest summits are the Ortler Spitze (12,814 feet), the Gross Glockner (12,405), the corner-stone of T., Salzburg and Carinthia; Wild Spitze (12,390), and Marmolata (11,045), the culminating point of the Dolomite district, on the Italian frontier. The Dolomites, formed of magnesian limestone (a rock named after the geologist M. Dolomieu), attract many tourists on account of their grand, fantastic outlines, and the weird splendour with which they are lit up at sunset, when their crests take the semblance of transparency. The principal rocks of T. are crystalline, Silurian, and Secondary, irrupted with trap and granite. There are 123 mineral wells, of which the most celebrated are at Rabbi, Antholz, Prax, and Obladis. The mining industry has lost its former importance, but there is still a slight yield of copper, iron, lead, silver, zinc, salt, marble, granite, &c. The mountains, which send down vast glaciers, are in many places clad with beeches to an elevation of 4000 feet, and beyond that by fir-woods. Of the surface only a small portion is cultivated, and that by clumsy methods. Next to the Etschthal the most productive parts are the Vorarlberg and the Zillerthal. In 1876 T. produced 250,000 hectolitres of wheat, 455,000 of rye, 175,000 of barley, 150,000 of corn, 480,000 of maize, 125,000 of buckwheat, and 1,060,000 of potatoes, besides some hemp, flax, tobacco, and chicory. In the S., where much fine fruit is cultivated, the yield of wine was 320,000 hectolitres in 1876 (586,000 in 1875). Cattle-rearing and dairy-farming are the chief occupations, and in 1870 there were in T. 402,152 cattle, 309,428 sheep, 121,997 goats, and 47,899 swine. The industries centre in Innsbruck, the chief town, Trent and Botzen. The Brenner railway, connecting the lines at Innsbruck and Botzen, crosses the Brenner Pass (4657 feet). Ethnographically the country is divided into German and Italian T., the inhabitants of the former being three times more numerous than those of the latter. A few miles above Trent there still stand two villages on opposite sides of an affluent of the Adige, the northern called Mezzo Tedesco or 'German Limit,' the southern Mezzo Lombardo or 'Italian Limit.' The Tyrolese are almost all Roman Catholics, and there are 2300 priests and 87 convents, with 1123 monks and 1162 nuns. Education is widely spread, and Innsbrück has a university; yet T., with its striking natural phenomena, its crosses, chapels, and religious symbols, is a land of ancient legend and modern superstition. An independent national diet meets at Innsbruck. Originally part of Rhætia, T. was conquered by the Romans and overrun by German tribes. Christianity was introduced as early as the 4th c. The northern valleys fell subsequently to the Bavarians, and were divided into *gaus*, which, after existing as petty lordships, were united by one family of counts, whose residence, the Schloss T., near Meran, gave its name to the whole country. Margarethe Maultasch, daughter of the last count, bequeathed her rights to her cousins, the dukes of Austria, who thus acquired T. in 1363. The S. valley, which had been seized by the Lombards, was formed into the diocese of Trent. By the peace of Pressburg (1806) T. was ceded to Bavaria; but the inhabitants were attached to the House of Hapsburg, to whose rule they were restored in 1814 (see HOFER, ANDREAS). The representatives of Italian T., or Wälsch-T., withdrew from the national diet in 1877, their demand for autonomy having received a decided check. There is, indeed, little chance of southern T. being joined to Italy. See Egger, *Geschichte Tirols* (Innsb. 1870 *et seq.*); and, for a sketch of the folklore, Miss R. H. Busk, *The Valleys of T.* (Lond. 1874).

Tyroliene', a song accompanied with dancing, originally a Tyrolese melody. The T. introduced by Rossini in *William Tell* was the first of the kind which was not a Volkslied.

Tyrone' (Irish Gael. *Tir-Eoghain*, 'Owen's territory'), an inland county of Ulster, Ireland, is bounded N.E. by

Londonderry, E. by Lough Neagh and Armagh, S. and S.W. by Monaghan and Fermanagh, and N.W. by Donegal. Area, 806,658 acres; pop. (1871) 215.766, of whom 119,937 were Roman Catholics, 49,201 Protestant Episcopalians, and 42,156 Presbyterians. The surface is hilly, being traversed to the N. by offshoots of the Donegal and Londonderry ranges, and of Monaghan and Fermanagh to the S., and the principal elevations are Slieve Sawel (2236 feet), Mullagh Clogher (2083 feet), and Oughtdoorish (1866 feet). The Blackwater, Ballinderry, and Camoan are the principal rivers, and with Lough Neagh (q. v.) and other smaller lakes and streams give a total water area of 31,043 acres. The soil of the central plain, overlying Tertiary and Old Red Sandstone formations, is a fertile loam, and the climate is moist, the rainfall of 1877 being 49·55 inches. Of 258,150 acres under crops in 1878, 1673 were in wheat, 112,614 in oats, 543 in barley, bere, and rye, 43,579 in potatoes, 16,908 in turnips, 18,475 in flax, and 60,220 in meadow and clover, and plantation covered 9777 acres in 1877. T. had (1878) 26,510 horses and mules, 1064 asses, 159,858 cattle, 46,083 sheep, and 38,105 pigs, while the valuation amounted to £434,015. Agriculture is the staple industry, but there are numerous flax-scutching mills, besides manufactures of linens, woollens, pottery, whisky, &c., and eleven collieries, which with one Antrim pit yielded 15,398 tons in 1877. Emigration has drained off one-third of the population since 1851, 84,613 persons having left the county up to December 31, 1877. Omagh (q. v.), Dungannon (q. v.), and Strabane (q. v.), are the chief places of T., which return two members to Parliament. In the earliest historic times T. was possessed by the Kinel Owen, a branch of the northern Hy Neill.

Tyrrhe'nian Sea (anc. *Tyrrhenum Mare*, and *Mare Tuscum*), the part of the Mediterranean Sea between the W. coast of Italy and the islands of Corsica, Sardinia, and Sicily.

Tyrtae'us, an ancient Greek poet who flourished at Sparta during the second Messenian War (685-665 B.C.). The tradition is that the Spartans being hard pressed by their foes consulted the oracle, who responded that a leader must be sought from Athens. This was done, but the Athenians, glad to play a sort of practical joke on the embassy, gave them a lame schoolmaster. The Spartans received the dubious gift with simple faith, and it was soon found that their trust was not ill placed. Their new leader proved a mighty genius, and especially a great poet. His songs in praise of the Spartan Constitution quelled discontent at home, whilst his martial odes inspired the soldiers in the field to victory. His poems were of three kinds, (1) martial exhortations, (2) political odes, (3) war marches. The fragments we possess are distinguished by a fine military fervour. The best edition is by Bach (Leips. 1831).

Tyr'whitt, Thomas, son of Dr. T., canon of Windsor, was born in London, 29th March 1730, educated at Eton and Queen's College, Oxford, and elected to a fellowship at Merton. He was Clerk of the House of Commons (1761-67), was appointed curator of the British Museum (1784), and died 15th August 1786. Besides several treatises on classical subjects, T. wrote *Observations on Some Passages in Shakespeare*, *The Canterbury Tales of Chaucer* (1775-78), and *Poems supposed to have been written at Bristol in the 15th c. by Rowley and others, with a Preface and Glossary*, to which he added an appendix proving that Chatterton was the author. T. merits remembrance mainly for his services as an editor of Chaucer. He was the first who sought to expel from the biography of the poet everything that did not rest on documentary evidence; his collation of the Chaucerian MSS., though not particularly discriminating, was extremely laborious; his arrangement of the 'Tales' is excellent; and his 'Dissertation' and 'Notes,' with all their linguistic imperfections, are of great and enduring value for the interpretation and illustration of the 'Father of English Poetry.'

Tyt'ler, William, a Scottish historian and antiquary, was born in Edinburgh, October 12, 1711, educated at the High School and University of his native city, and in 1744 was admitted to the Society of Writers to the Signet. He died September 12, 1792. T. wrote several valuable works, among others *A Historical and Critical Inquiry into the Evidence produced against Mary, Queen of Scots* (1759; 4th ed. 1790), in which he warmly espouses the cause of the unfortunate princess, *The Poetical Works of James I. of Scotland* (1783), to which he prefixed a dissertation on the life and writings of the royal bard, and *A Dissertation on Scottish Music*, which first appeared as an appendix to Arnot's *History of Edinburgh*. See Henry Mackenzie's *Account of the Life and Writings of Willam T. of Woodhouselee*.—**Alexander Fraser T., Lord Woodhouselee**, son of the preceding, was born at Edinburgh, Oct. 15, 1747, entered the High School in his eighth year, and left dux of the rector's class. After spending two years at an academy in Kensington, where he assiduously cultivated the accomplishment of Latin verse, he went in 1765 to the University of Edinburgh, and passed advocate at the Scotch bar in 1770. In 1786 he became Professor of Civil History, in 1790 Judge-Advocate of Scotland, and in 1802 was raised to the bench, when he took the title of Lord Woodhouselee, from an estate near Edinburgh belonging to his father. He died January 5, 1813. T. was one of the most scholarly lawyers and litterateurs of his age. His chief writings are *The Decisions of the Court of Session from its first Institution to the present Time* (Edinb. 1778), *Plan and Outline of a Course of Lectures on Universal History, Ancient and Modern* (Edinb. 1783; the *Lectures* themselves were not published till 1834-35), *Elements of General History, &c.* (Edinb. 1801), a work that was long remarkably popular, and *Memoirs of the Life and Writings of the Hon. Henry Home of Kames, containing Sketches of the Progress of Literature and General Improvement in Scotland during the greater part of the Eighteenth Century* (Edinb. 1807).—**Patrick Fraser T.**, youngest son of the preceding, was born at Edinburgh, 30th August 1791, educated at the High School and University of Edinburgh, and passed advocate at the Scotch bar in 1813. For some years he held the office of King's Counsel in Exchequer. In 1819 he first appeared as an independent author by the publication of a *Life of James Crichton of Cluny, commonly called the Admirable Chrichton* (1819; 2d ed. 1823), a work of great care and labour, and marked by much original research. It was followed in 1823 by *An Account of the Life and Writings of Sir Thomas Craig of Riccarton, including Biographical Sketches of the most eminent Legal Characters, from the institution of the Court of Session by James V. till the period of the Union of the Crowns*. In 1826 he published anonymously a *Life of John Wickliffe*. But his *magnum opus* was his *History of Scotland*, undertaken by the advice of Sir Walter Scott. It extended to 9 vols., of which the first appeared in 1828 and the last in 1843. It opens with the accession of Alexander III. in 1249, and closes with the accession of James VI. to the throne of England in 1603. T.'s history is a work of great and genuine erudition; and though criticism has made havoc of some of his authorities, *e.g.* the so-called 'Fordun,' and introduced into the discussion of disputed questions considerations unknown to T., its essential value has not been impaired. The author has been surpassed, but not superseded, by Hill Burton. While occupied with the composition of his chief work T. wrote several historical biographies of considerable merit, of which the most important is his *Lives of Scottish Worthies* (3 vols.) and his *Life of Sir Walter Raleigh* (1832). T. died at Great Malvern, Worcestershire, 24th December 1849. See the Rev. John Burgon's *Memoir of P. F. T.* (Lond. 1859). There is also a shorter sketch by John Small, prefixed to a recent edition of the *History of Scotland*.

Tzetz'es, Johannes, Greek poet and grammarian, was born about 1120 A.D. at Constantinople, and died about 1183. His *Chiliades*, a collection of 30,000 'political iambics,' whose theme is stories drawn from Greek history and mythology, has been edited by Kiessling (Leip. 1826); his *Iliaca*, a résumé of Homer's *Iliad* and kindred poems, by Bekker (Berl. 1816). Worthless as literary productions, these yet contain a large store of valuable matter that otherwise had perished. Commentaries on Homer, Hesiod, the *Plutus* of Aristophanes, and Lycophron's *Alexandra* (ed. by Müller, 3 vols. Leip. 1811), make up the remaining works of T.

U.



the twenty-first letter of the English alphabet, and the last of the true vowel sounds. In the Semitic alphabet it does not exist, and in both Greek and Latin its character was confused with that of the cognate consonant V. Its proper phonetic value is that heard in 'full,' but more commonly expressed by 'oo.' Its two remaining sounds in English, that in 'mud' and that in 'union,' are both of them anomalous and almost peculiar to our language. The former sound is really that of a short A. The latter sound, which is the commonest of the three, is really YU, and may be paralleled by the fact that the Greek U, or Hypsilon, is always aspirated at the beginning of a word. The modified German U, ü or ue, is a peculiar sound that ought not to be difficult to Scotchmen or Devonshire men; it is also found in French as 'eu.' In modern Greek, U is pronounced as simple I. In transliteration from the Greek, most modern languages follow the Latin in substituting Y for U; as 'hyacinth.' As a diphthong, U sometimes reverts to the pronunciation of the original V, as is the case with 'au' and 'eu' in modern Greek, and sometimes has the peculiar sound of 'ow,' as with Ger. 'au,' Eng. 'ou,' and Dutch 'ui.' U most frequently interchanges with O: as Gr. *theos* = Lat. *deus;* Lat. *uncia* = Span. *onza*, and our 'ounce;' Lat. *lupus* = Fr. *loup*.

Ube'da, a town of Spain, province of Jaen, on a fertile plateau about 2000 feet above the sea, between the rivers Guadalquivir and Guadalimar. It has a castle, several churches, monasteries and other large buildings; and trades in cloth, leather, wine, and oil. Pop. 18,378. The Moorish king, Mohammed, surrendered here in 1210 to the allied kings of Navarre and Castile.

Ucay'ale, or **Ucay'ali,** a great river of Eastern Peru, and one of the main affluents of the Amazon, of which it was formerly regarded as the head-stream. This honour is now accorded, however, to the Marañon, which, though shorter than the U., is twice as broad as the latter at their confluence. The U. rises in the mountains of Southern Peru, some of its feeders having their sources only 150 miles from the Pacific on the one hand, and 100 miles from Lake Titicaca on the other. In its upper course the U. is known as the Apurimac (q. v.), and below the junction of the Mantara, in 12° S. lat., it is called the Tambo. After receiving the united waters of the Urubamba and Camisea in 9° S. lat., it becomes known as the U. Its entire course is about 1200 miles in length. The U. has been navigated by steamers for a great part of its course, and a steamer has penetrated by the Pachitea, a tributary on its left bank, to within 220 miles of Callao. The Apurimac is not navigable; but with this exception, and that of a fall on the Lower Urubamba, the U. and its principal tributaries are most valuable highways to the heart of a region abounding in vegetable and mineral wealth.

U'dal Right. See ODAL.

U'dall, Nicholas, the author of the first English comedy, was born in Hampshire about 1505 or 1506. Having received his education at Oxford, he chose the profession of a schoolmaster, and in 1534 he passed M.A. and obtained the post of headmaster of Eton, which he held till 1541, when he was dismissed. He afterwards resigned the vicarship of Braintree in Essex, which he had enjoyed along with his mastership; but he continued both to teach and preach, and in 1551 we find him admitted a prebendary of Windsor, and in 1554–55 appointed headmaster of Westminster school. He died in 1556. U.'s comedy of *Ralph Roister Doister*, which was probably written for the Eton boys, is a perfectly harmless piece, with a fair amount of vivacity in its execution and ingenuity in its plot, the hero being led into various awkward situations in the course of his suit to Dame Custance, partly by his own stupidity, and partly by the malicious suggestions of Mathew Merrygreek. The play is in rhyme, and has thirteen *dramatis personæ*. Hallam notices that the choice of a city-galiant for 'hero' probably determined in some measure the prevalent subject of English comedy all through the Elizabethan age. The exact date of its composition has not been determined; it is quoted in the 3d edition of Sir Thomas Wilson's *Rule of Reason* (1553), but *not* in the 2d edition (1552). There is but *one* copy of U.'s comedy in existence, having no title-page; but it was probably printed in 1566. It is now in the library of Eton College. Of the other productions of U.'s pen it is enough to name *Flowres for Latin Speakynge* (portions of Terence done into English, 1533), translations of part of Erasmus's Paraphrase of the New Testament, and of Peter Martyr's tract on the Eucharist, and a few Latin letters and poems. See Wilson's *Arte of Logike* (1567), Bliss's edition of Wood's *Athenæ Oxonienses*, and the preface to Arber's reprint of *Roister Doister* (1869).

Udi'ne, the chief town of a province of the same name in N. Italy, on the Roja, 75 miles N.E. of Venice by the Venice and Trieste railway. The seat of an archbishop, it is girt by old walls, and has a castle which dates from 1517, and was formerly the residence of the patriarchs of Aquileia. Its chief buildings are the Palazzo Publico (built in 1457, partly burned in 1876), the Romanesque cathedral, adorned with fine sculpture in wood and stone, and the episcopal palace. The Campo Santo is one of the finest cemeteries in Europe. There are manufactures of hats, leather, metal wares, gloves, &c., and a good trade in wine. Pop. (1876) 22,692. In the adjoining village of Passerino is the castle of the Venetian Doges, occupied by Napoleon during the negotiation of the peace of Campo Formio in 1797.

Ue'berweg, Friedrich, a German philosophical writer, born 22d January 1826, at Leichlingen in Rheinpreussen, studied philology at Göttingen under K. F. Hermann, and philosophy at Berlin under Beneke, and was successively a teacher at Elberfeld (from 1851), *privat docent* at Bonn, extraordinary (1862) and ordinary (1867) professor of philosophy at Konigsberg, where he died, June 9, 1871. His principal works are *System der Logik und Geschichte der logischen Lehren* (Bonn 1857; 4th ed. 1874; Eng. trans. by T. Lindsay, 1871), *Grundriss der Geschichte der Philosophie von Thales bis auf die Gegenwart* (3 vols. Berl. 1863–66; 5th ed. 1877; Eng. trans. by G. S. Morris, 2 vols. 1874).

U'fa, a government in E. Russia, lying W. of the Ural chain, formed in 1865 out of the N.W. part of Orenburg. Area, 47,031 sq. miles; pop. (1871) 1,364,925. It is mountainous in the E., but in the W. the surface slopes to rich plains largely covered with forests, and watered by the Bielaia, which receives the Ufa and many affluents from the Ural mountains. The soil is fertile, but only a small portion is under tillage. Rich deposits exist of iron, lead, copper, and gold, still little wrought.—**U.,** chief town of the preceding, at the junction of the U. and the Bielaia, 210 miles S. of Perm, is the seat of a Greek archbishop and a Tartar mufti, has twelve churches, several mosques, and holds every January a ten days' fair, which is much frequented. Pop. (*St. Petersb. Cal.* 1878) 20,917.

Ugan'da, a kingdom of Central Africa, extending half round the N. and W. shores of Lake Victoria Nyanza (q. v.). It is about 300 miles long and 60 miles broad, with a pop., including that of tributary tribes, estimated by Stanley at 2,775,000. The general aspect of U. is that of a rolling, wooded, fertile, and cultivated country, traversed by broad, well-made roads. Coffee

(which is chewed instead of boiled by the natives), tobacco, the sugar-cane, yams, and bananas, grow in profusion, and large herds of cattle and goats are reared. Elephants are numerous, and are hunted for their ivory. Iron is abundant in many places. The capital, Ulagalla, situated a little way inland from the lake not far from its outlet, is a large town finely laid out with straight, broad streets lined with trees, and centres in the royal quarters, which form a town in themselves, crowning an eminence and having seven broad avenues radiating from them. The chief industries are iron-working, the tanning of skins, and weaving of bark cloth. The women do all the field-work. The king, Mtesa, is very friendly to Europeans, and at his request missionaries commenced their labours at Ulagalla in 1878. See Speke's *Journal of the Discovery of the Source of the Nile* (Lond. 1864), Stanley's *Through the Dark Continent* (Lond. 1878).

Uglitch', a town of Russia, government of Jaroslav, on the right bank of the Volga, 40 miles S.W. of Rybinsk. It manufactures paper, leather, soap, copper, and tin wares, and conducts a large transit trade in timber. Pop. (*St. Petersb. Cal.* 1878) 13,069.

Uh'land, Johann Ludwig, one of the most popular poets of modern Germany, was born at Tübingen, 26th April 1787, studied at the Gymnasium and University of his birthplace, and in 1810 went to Paris ostensibly to study the Code Napoleon, but chiefly occupied himself in examining old French and German manuscripts relating to the Middle Ages. On his return to Germany he engaged in business for some time as a lawyer in Stuttgart. His ardent poetic temperament, and his deep national sympathies, caused him to take an intense interest in the German War of Liberation. U. gave expression to his country's aspirations and his own in his noble *Gedichte* (Stuttg. 1815; 60th ed. 1875), which, enriched by numerous additions, remains his greatest work. This was followed a few years afterwards by two dramas, *Ernst, Herzog von Schwaben* (Heidelb. 1818), and *Ludwig von Bayer* (Berl. 1819). His next work, *Walther von der Vogelweide* (Stuttg. 1822), showed a profound knowledge of early German history. In 1829 U. was appointed Professor of German Literature at Tübingen, but resigned his chair in 1832 for political reasons. In 1836 he published a dissertation *Ueber den Mythus vom Thor* (Stuttg.), and in 1844 a very excellent collection of old popular German ballads entitled *Alte hoch und niederdeutscher Volkslieder.* He died at Tübingen, 13th November 1862. As a poet, U. takes a foremost rank among the representatives of the Romantic school. An intensely keen and true poetic instinct enabled him to grasp the permanently beautiful and true element in some old story, and reproduce it with no charm gone in modern dress. His best poems are lyrics or ballads. In the first, some quaint fine thought is touched to some unexpected yet pleasing issue; in the other, a picture is often painted in a few suggestive words—as, for instance, in such masterpieces as *Das Schloss am Meer*, *Auf der Ueberfahrt*, and *Der Wirthlein Töchterlein.* All his poems are pure and high-toned. Their melody is exquisite, deep, and true. It vibrates long in the ear, and lingers long in the mind, like the memory of some dear possession that we let go slowly and unwillingly. U.'s prose writings, including his lectures on German literature, were edited by Keller, Halland, and Pfeiffer, under the title *Schriften zur Geschichte der Dichtung und Sage* (8 vols. Stuttg. 1866-69). See Jahn's U. (Bonn 1873); Pfeiffer, U. (Wien 1862); Natter, *Erinnerungen an U.* (Stuttg. 1863); and U.'s *Leben*, edited by his widow (Stuttg. 1874). Several of U.'s poems are exquisitely translated by Longfellow in his romance of *Hyperion.* See also translations by Skeat (Lond. 1864) and Sandars (Lond. 1869).

Uh'lans, a word of Tartar origin signifying 'brave,' which, transferred from the Tartar horsemen who harassed the Polish frontier to the Polish light cavalry raised to repel their inroads, was introduced into the Austrian service (1791), and the Prussian (1808). See CAVALRY and LANCERS.

Uist, N. and S., two of the Outer Hebrides, forming part of the shire of Inverness, Scotland, and about 15 miles W. of Skye. They lie S. of Lewis and Harris, and the island of Benbecula (q. v.) intervenes between them. N. U. is 16 miles long, and from 3 to 13 broad. Pop. (1871) 3222. The coast, especially on the E., is much indented, and excellent harbours are formed at Loch Maddy and elsewhere. The surface is mostly a boggy peat-moss with hills in the W. There are some small fields of oats and clover. The inhabitants are chiefly fishermen. S. U., longer and narrower than N. U., has a range of hills along its E. coast, of which the highest, Mount Heckla, is 2500 feet high. Loch Boisdale, on the same side, forms an excellent harbour. The W. part is somewhat fertile, and is covered with numerous lakes. The inhabitants, mostly Roman Catholic, engage chiefly in fishing. Pop. (1871) 3669.

U'jein. See OOJEIN.

U'jhély-Satoral'ya, a town of N. Hungary near the Bodrog, an affluent of the Theiss, 40½ miles S.E. of Kaschau by rail, in the vicinity of vineyards and marble quarries. Pop. (1869) 9946.

Uji'ji, a small territory on the N.E. shore of Lake Tanganyika, Central Africa. Area, 920 sq. miles; pop. 36,000. The natives are a fine-looking but drunken and dishonest race. They are good smiths and expert fishers and canoemen. The chief town of U., Kawele, in 4° 47′ S. lat., is a place of considerable trade. Besides being the terminus of the great caravan route from Zanzibar and the residence of a number of Arab traders, it has a daily market, which is largely attended by natives from all the neighbouring tribes on both sides of the lake. On account of its beautiful situation and healthy and pleasant climate, Kawele has been called 'the watering-place of explorers.' Pop. 3000.

Ukase' (Russ. *ukasat*, 'to speak'), in Russian, the name of edicts issued either by the Czar or the Senate, respecting legislative or administrative measures. They have the force of laws until superseded by subsequent orders, promulgated in the same manner. In 1827, the ukases, which had accumulated since 1649, the date of the last attempt at codification, were collected, by order of the Czar Nicholas, in 48 vols. Since then they have been collected annually, and form the basis of the *Swod* or Imperial Code.

U'kert, Friedrich August, a German historian, born at Eutin, October 28, 1780, studied at Halle and Jena, and was successively inspector at the Gotha gymnasium and librarian at the ducal library. He died May 18, 1851. His chief writings are *Geographie der Griechen und Romer* (3 vols. Weim. 1818-46), and *Ueber Dämonen, Heroen und Genien* (Leip 1850). In conjunction with Heeren, U. wrote a *Geschichte der Europäischen Staaten*; and with Jacob, *Merkwurdigkeiten der herzoglichen Bibliothek zu Gotha* (3 vols. Leip. 1835-38).

Ukraine' (Slav. 'border-land'), the name originally of the Polish frontier towards the Tartars, and latterly of the fertile, ill-defined region in the basin of the Dnieper, which was long an object of bitter contention between Poland and Russia. The latter power acquired the portion lying on the E. side of the Dnieper by the peace of Andrussov (1667), and subsequently, on the second partition of Poland in 1793, the western portion also, which is mostly comprised in the government of Kiev (q. v.). The historical U., also called Little Russia, consists of the governments of Kiev, Kharkov, Tchernigov, and Poltava.

Ulcera'tion is defined by Mr. Paget as 'that part or effect of an inflammatory process in which the materials of inflamed tissues liquefy or degenerate, are cast off in solution or very minute particles from free surfaces, or, more rarely, are absorbed from the substance of the body. When degenerate or dead substance is cast off in one or more portions visible to the naked eye, the process is usually called gangrene; when the portions are not so visible, or are quite dissolved, it is called U.' The matter discharged during the process of U. may be sanious or foul, ichorous, contagious, &c., and as the healing process advances, the matter gradually approaches to healthy pus.

Ul'cers (Lat. *ulcus*, 'a wound') are the granulating surfaces resulting from the process of ulceration which may have been going on around a wound, or after the separation of a slough. U. are divided into two classes, according to the constitutional causes on which they depend, and the local characters which they present.

1. *U. depending on Constitutional Causes.*—Of this class twelve varieties are described, of which the most important are—(1) The *simple* or *healthy* U., such as that which follows accidental injury in a healthy person. The base is level and slightly depressed, the edges shelve gently, and are scarcely harder than the adjacent healthy skin, the granulations are florid, uniform, small, and vascular, and the pus is healthy. The treatment

consists in protecting the ulcer from irritation or congestion, by dressing it with dry lint, or simple water dressing. (2) The *inflammatory* U., usually small and single, the surrounding skin being hot and red, and generally œdematous, the edges are abrupt, irregular, and shreddy; the base is level and but little depressed, and owing to the absence of granulations looks raw, the colour being ruddy, ash grey, or yellowish. Burning pain is generally felt in the part. The discharge is ichorous, then watery, frequently mixed with blood, excoriating the edges owing to its acrid nature. The treatment consists in subduing the inflammation by rest, and by warm soothing applications. In cases of *inflammatory* U., the patient, who is generally weak and debilitated, should have nourishing diet and general tonic treatment. (3) *Strumous* U. often follow softening of sub-cutaneous masses of tubercle. Their most common site is the lymphatic glands in the neck and groin, and on the face and head. The U. are originally small and oval, but they usually coalesce into irregular shapes; the base is soft and unequal; the granulations are large, pale, soft, and bleed easily; the edges are undermined, pale-pink or purplish; and the pus is thin, greenish yellow, and sometimes curdy. The treatment consists in the general treatment of Struma (q. v.), viz., generous diet, cod-liver oil, and tonics. (4) *Syphilitic* U. appear in connection with secondary or tertiary syphilis, most frequently the latter. There are two forms of tertiary U.,—the *superficial*, which follows ulcerative eruptions; and the *deep*, which usually commence in the softening of a subcutaneous gummatous swelling, leaving a circular, indurated, sloughing sore. This form may penetrate even to the periosteum or bone. The discharge from such U. is contagious. The first indication of treatment is to subdue the inflammation. The calomel vapour-baths may be applied to the whole body, or in the form of local fumigation, with a mercurial lotion or ointment to the part; and, for a permanent cure, a course of mercury, in some form or other, is necessary. The others are *eczematous* U. resembling the inflammatory, but complicated with eczema of the surrounding skin; *cold* U., also resembling the inflammatory, and occurring in persons of feeble circulation; *senile* U., having a tendency to slough; *scorbutic* U., which have on their surface the vibices and petechiæ of scurvy; *gouty* U., appearing over gouty deposits; *lupous* U., following the appearance of tubercles of Lupus (q. v.); *rodent* U., strumous affections occurring most commonly on the head and face; *cancerous* U., which may commence in the skin, or may occur from the adherence of the skin to a cancerous mass, the skin being infiltrated with Cancer (q. v.).

2. *U. depending on Local Conditions.*—The chief of these are —(1) *Varicose* U., caused by the pressure of the blood in varicose veins above, are usually situated above the inner ankle. The treatment consists in relieving the congestion by elevating the limb, subduing the inflammation by emollient applications, and the application of well-regulated pressure, which may be effected by the indiarubber bandage. (2) The *callous, chronic*, or *indolent* ulcer is usually situated on the leg, which it sometimes encircles. Any kind of ulcer may become chronic. The peculiarity consists in its chronicity, and its base is deep, flat, pale, or tawny; the edges are raised and callous; the granulations are very small, and the pus is thin and offensive. The most effectual mode of treatment is by applying a blister over the whole sore and its edges. In some cases strapping and bandaging are sufficient; but in other cases, incisions through the ulcer and into the healthy parts, on all sides, may be necessary. Transplantation and Grafting of Skin (q. v.) is often of great value in the treatment of U. Others are *œdematous* or *weak* U., such as occur in œdematous limbs; *exuberant* U., in which the granulations project considerably beyond the surface, and which may be treated by pressure and the application of nitrate of silver or sulphate of copper; *hæmorrhagic* U., depending upon a variety of causes; *neuralgic* U., attended with great pain; and *inflamed* U., depending for their condition on local irritation.

Uleaborg (Finn. *Oulu*), the largest and furthest N. government of the grand-duchy of Finland. Area, 59,261 sq. miles; pop. (1875) 193,494. U. is well watered by the Lakes Uleaträsk, Kitkajärvi, Kiando, Enare, and others, and by the rivers Oulunjoki, Kemijoki, Ulea, and Tornea, of which the latter, with its affluent the Muanio, forms the boundary with Sweden. In the interior and E. parts the chief features are woods and swamps; in the coast districts there is considerable cultivation. Fishing and wood-cutting are the chief occupations. In the N. are about 600 Lapps, who live by their reindeer.—**U.**, the capital, on the Gulf of Bothnia, and situated at the mouth of the Uleaelf, is the seat of the governor, has a lyceum, a hospital, a dock, and several factories, and carries on trade in tar, pitch, and wood. U. was founded in 1605, in great part burnt in 1822. In 1854 the English burnt several ships in the harbour. Pop. (1875) 8700.

Ule'ma (*i.e.*, 'learned') is the name given by the Turks to one who has passed through a complete course of liberal education. As this means solely the study of the Koran, and as the Koran is the source of all human as well as divine law, the U. are divided into *Imaums* (q. v.) or religious teachers, *Muftis* (q. v.) or expounders of the law, and *Cadis* (q. v.) or judges.

U'lex. See FURZE.

Ul'filas (the Greek form of the Gothic Ulfila, *i.e.*, *Wulfila*, 'a wolf') was born in 311 A.D., in one of the Gothic settlements to the N. of the Danube. He was probably of pure, perhaps noble Gothic blood, the story told by Philostorgius, that his progenitors were among the prisoners brought by the Goths from Cappadocia in 258, resting on very insufficient authority. Being sent to Constantinople on an embassy—possibly as a hostage—he adopted the Christianity of the capital, which was then of the Arian type, and was appointed 'Anagnostes;' and it was probably while holding this office, which in the Greek Church involves preaching as well as reading, that he executed the Gothic translation of the Scriptures. Early in the year 341, having just reached the required age, he was consecrated bishop of the Goths by Eusebius of Nicomedia at Antioch, and immediately returned to his people across the Danube. After labouring among them for seven years, he and his converts were obliged by the persecution of the heathen prince Athanaric to take refuge within the limits of the Roman empire, and for the rest of his life he continued to labour in the country of the Balkans. Subsequently to the first Gothic immigration and shortly before the battle of Adrianople in 378 U. seems to have been employed in fruitless negotiations between the Gothic and Imperial generals; and three years after (in 381) he died at Constantinople, having come there partly to remonstrate with a lapsed sect of semi-Arians, partly to petition the emperor for a General Council. U. translated into Gothic both the Old and the New Testaments, with the exception apparently of four books (1 and 2 Samuel, and 1 and 2 Kings); but only a small proportion of his work has been preserved. Mark is the only one of the Gospels that is complete; the Acts of the Apostles, the Epistle to the Hebrews, those of James, Peter, John, and Jude, and the Apocalypse, are altogether lost; and the Old Testament has left only a few fragments. But the fact that they furnish the oldest text of any German tongue, renders even the minor relics of inestimable value to the philologist. The principal MS. is the *Codex Argenteus*, written with silver letters on a purple parchment, which was discovered by Arnold Mercator about the end of the 16th c. in the Abbey of Werden near Düsseldorf, and after various vicissitudes was enshrined in silver at Upsala in Sweden. Portions of the Epistle to the Romans were found on a palimpsest (*Codex Carolinus*) at Wolfenbüttel in 1756, and portions of other Pauline epistles on palimpsests at Bobbio by Mai and Castiglione in 1818. A Gothic paraphrase, probably of the 6th c., based on U.'s version of John's Gospel, was published by Massmann (Munich 1834). The chief editions of U. are Francis Junius (Dort. 1665, Amst. 1684), Edward Lye (Oxf. 1750), Lahn (Weissenfels 1805), Gabelentz and Löbe (Leip. 1843-60), Massmann (Stuttg. 1857), and Stamm (Paderborn 1858, &c., new ed. by Heyne, 1874). The original authorities for the life of U. are (1) Philostorgius as quoted by Photius; (2) incidental allusions in the ecclesiastical historians Socrates, Sozomen, Theodoret, and the author of the Acts of Nicetas on the one hand, and the secular historians Drosius, Jordanes, and Isidore on the other; (3), contemporary notices quoted on the margin of the MS. containing various ecclesiastical writings by an Arian bishop, Maximinus. See also Ihren, *Analecta Ulphiliana* (Upsala 1769); Waitz, *Ueber das Leben des U.* (Hann. 1840); Bessel, *Ueber das Leben des U.* (Gött. 1860); Uppström, *Codices Gotici Ambrosiani* (Leip. 1868); and Bernhardt, *Vulfila, oder die Gothische Bibel* (Halle 1875).

Uliasutai, the capital of the Chinese province of Shen-si, in Mongolia, on the line between Si-Ngan-Foo and the Russian

frontier. It is an important depôt for the central Asiatic trade with China, and is defended by a garrison of Chinese. The pop., partly Chinese, partly Mongolian, is greatly increased during the fair by the Mongolian nomads, who pitch their tents in the vicinity. Owing to the occasional eruption of the Dzungar rebels from Urumsti, the Russians have failed to open a trade at U., though they tried repeatedly since 1868.

Ull'mann, Karl, a Protestant theologian, born March 15, 1796, at Epfenbach in the Palatinate, studied theology at Heidelberg and Tübingen, and became extraordinary professor (1821) of theology at Heidelberg, and ordinary professor at Halle (1829) and at Heidelberg (1836). In 1828 U. started with Umbreit (q. v.) the *Theologische Studien und Kritiken*. In 1853 he was made a member of the 'Oberkirchenrath' of Baden, of which he became 'Direktor' in 1856 at Karlsruhe, where he died, January 12, 1865. U.'s chief works are *Gregorius von Nazianz, der Theolog* (Darmst. 1825; 2d ed. Gotha 1867); *Johann Wessel, Ein Vorganger Luther's* [Hamb. 1834, afterwards as *Reformatoren vor der Reformation* (*ib.* 1841-42; 2d ed. 2 vols. 1866); *Historisch oder mythisch?* (Hamb. 1838); *Ueber die Sündlosigkeit Jesu* (*ib.* 1841; 2d ed. 1863); *Das Wesen des Christenthums* (Hamb. 1849; 5th ed. Gotha 1865). See Beyschlag, *Dr. Karl U.* (Gotha 1867).

Ulls'water (named after Ulla, a Norse chief), the second largest of the English lakes, lies between Cumberland and Westmoreland, and is 9 miles long by ¾ths of a mile wide, 210 feet deep, and 380 feet above the sea. Divided into three reaches, it grows by degrees more wild and beautiful as one goes up by steamer from Pooley Bridge at the foot to Patterdale at its head, where offshoots of Helvellyn tower upon the right hand, and on the left Birk and Place Fells.

Ulm ('the place of the *elm*'), a town of Würtemberg, capital of the Donaukreis, and one of the most important fortresses of Germany, lies on the left bank of the Danube, a little below its junction with the Iller, 53 miles W. of Augsburg by rail. Three bridges unite it with Neu-Ulm, a suburb on the right (Bavarian) bank, which is also included in the general lines of fortification. The Minster, in the centre of the city, is the largest Protestant church in Germany. It is in pure Gothic style, and was commenced in 1377, but is still unfinished; the tower when completed will be 514 feet in height. The interior originally consisted of a nave and two aisles, but in 1507 the latter were divided, the total breadth being 167 feet, and length 477. The choir stalls by the elder Sylin (1469-74), the holy-water basin by the younger Sylin (1507), the pulpit, ciborium, &c., are well worthy of note; the organ (built in 1856) is the largest in Germany, containing 100 stops and 6286 pipes. The Rathhaus (16th c. Transition style), with remains of frescoes; the Fischkorsten, a beautiful fountain erected in 1482 by the elder Sylin; the Neue Bau, containing the Government offices, the gymnasium, the industrial school, and the hospital, are among the most important of the other buildings. The chief industries are linen-weaving, cutlery, and clock-making. U. is also celebrated throughout Germany for its confectionery, and is a centre for considerable trade in wood and garden produce. Pop. (1875) 30,222. U. first appears in history in the time of Karl the Great, by whom it was made a villa-regia. In 1134 it obtained the privileges of an imperial city, and gradually increased in importance till at the period of the Reformation it was the chief member of the Swabian Confederation. It adopted Reformed principles, but had in 1546 to yield to Karl V., and shared in all the horrors of the Thirty Years' War. In 1620 a truce between the Evangelical and Catholic parties was signed here, and on March 14, 1647, the armistice between the French, Swedes, and Bavarians. In 1803 U. ceased to be a free city, and became the capital of the Ober-Donaukreis; and two years after the Austrian General Mack, having been defeated in the immediate neighbourhood by Napoleon, shut himself into U., but had to surrender with 23,000 men. Since 1809 U. has belonged to Würtemberg. See Pressel, *U. und sein Münster* (Ulm 1878); Hassler, *Ulms Kunstgeschichte im Mittelalter* (Stuttg. 1872).

Ulma'ceæ, a natural order of apetalous dicotyledonous trees or shrubs, possessing bitter, mucilaginous, astringent properties. Dr. Hooker places the genera at 3 or 4, and the species at about 18, distributed through the N. temperate zone. *Ulmus* is the principal genus. See ELM.

Ul'na, one of the two bones of the fore-arm of Vertebrata—the companion bone to the radius (see ARM). In birds it is longer than the radius; but in ruminants, in bats, and in such Ungulates as the horse, the U. dwindles to a mere appendage of the radius.

Ulodon'dron, an extinct genus of plants found in the Carboniferous or coal formations. The stem was marked by small scars of somewhat rhomboidal form, and which represented the attachments of leaves or fronds. A double series of larger markings is arranged on opposite sides of the stem, these being absent in Lepidodendron (q. v.). By most palæontologists, U. is regarded as a near ally of Lepidodendron.

Ulpia'nus, Domit'ius, an eminent Roman jurist of Tyrian origin, flourished in the 3d c. A.D. He was held in high honour at court, especially during the last years of his life, and filled the offices of Scriniorum Magister, Præfectus Annonæ, and Præfectus Prætorio. He was assassinated by soldiers in the year 228. The *Digest of the Civil Law* contains 2462 excerpts from his writings, which thus form about one-third of the whole collection. His style, though somewhat diffuse, is clear and direct. He was a man of great acumen and sound common-sense. The vast influence of the Roman civil law on the modern world is in a great measure due to his influence. See *Domitii Ulpiani Fragmenta* (best editions, Hugo, Berl. 1834; and Bocking, Bonn 1836). Also Schelling's *Dissertatio critica de Ulpiani Fragmentis* (Bresl. 1824), and Heimbach, *Ueber Ulpians Fragmente* (Leip. 1834).

Ulri'ci, Hermann, a German philosopher and critic, was born at Pforten in Niederlausitz, 23d March 1806, studied law at Halle and Berlin, and was appointed professor of philosophy at Halle in 1834. He is best known as a Shakespearian critic. His works show great learning and a remarkable power of theoretical criticism, but are marred by the 'occasional alliance of excessive profundity of interpretation with heaviness of style.' The chief are *Geschichte der hellenischen Dichtkunst* (2 vols. Berl. 1835), *Shakespeare's Dramatische Kunst* (3 vols. Halle 1839; 3d ed. Leip. 1868, trans. by L. Schmitz, 2 vols. Lond. 1846), *Das Grundprincip der Philosophie* (2 vols. Halle 1845-46), *Gott und die Natur* (Leip. 1862, 3d ed. 1875), *Leib und Seele* (2 vols. Leip. 1866, 2d ed. 1874), *Abhandlungen zur Kunstgeschichte als angewandter Æsthetik* (Leip. 1876).

Ul'ster (Danish form of the Irish *Uladh*, or *Dal-Araidhe*), the most northerly province of Ireland, embraces the nine counties of Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone. Area, 8315 sq. miles, or 5,321.580 acres; pop. (1851) 2,011,991, (1871), 1,833,228, of whom 894,525 were Catholics, 484,425 Presbyterians, and 398,705 Protestant Episcopalians. Emigration, the chief cause of the decrease in population, is still continuing, 16,723 persons having left the province in 1877. In that year the valuation amounted to £4,226,000, the poor-rates to £152,420, and the number of paupers to 57,015; in 1878 there were 1,295,872 acres under tillage, 2,634,065 in grass, meadow, and clover, 62,684 of woods and plantations, 5959 fallow, and 1,322,820 bog and waste. Owing to the 'Plantation of U.' in 1610 (see IRELAND) the Celtic element is weaker here than in the other provinces, and it is very unequally distributed, since, while populous Antrim contained (1871) but 15 persons who could speak only Erse, and 2232 speaking both Erse and English, Donegal had 18,629 of the former, and of the latter 44,506. From James' colonisation dates the prosperity of U., whose principal source is the cultivation and manufacture of flax.

Ul'ster King-of-Arms, the chief heraldic officer for Ireland, whose office was created by Edward VI. in 1552. Under the 'King' are two heralds, four pursuivants, a registrar, and a clerk of records.

Ultima'tum (Low Lat. 'last,' 'extreme'), in diplomatic negotiations is the final deliverance of the one party, the rejection of which usually involves an immediate rupture of diplomatic relations and a declaration of war.

Ul'timus Hæ'res ('the last heir') in Scotch law is the Crown.

Ultramarine', a brilliant blue colour, in very extensive use by painters, paper-stainers, calico-printers, and others. The substance previous to the year 1828 was obtained only from lazulite or lapis lazuli, a beautiful and costly mineral sub-

stance. The mineral being rare, and much prized for ornamental inlaying, and the colour being of unapproachable brilliance and depth, it was an extremely expensive pigment. In consequence, strenuous efforts were made to obtain an equally valuable product by artificial means. In 1824 the French *Société d'Encouragement pour l'Industrie Nationale* offered a premium of 6000 francs for the manufacture of an U. blue, possessing all the qualities of that extracted from lapis lazuli, and in 1828 the prize was awarded to M. Guimet of Lyon, who after four years' investigation succeeded perfectly in producing the valuable substance by a synthetical process. The U. thus made was declared by competent judges to be in every way equal to the natural product; and Horace Vernet, who was one of the first to use the material, after employing it in his famous picture, 'The Battle of Fontenoy,' declared the substance to be even superior to natural U. M. Guimet's factory has continued since that time to manufacture U. of the highest quality. His process was never made public; but in the same year, 1828, Gmelin, a German chemist, made public a process for manufacturing U. which was extensively taken up and worked in Germany. These two discoverers may thus be fairly credited with the joint honours of this most brilliant triumph of chemical research. The composition of artificial U. varies considerably, as does also its colour, the latter showing many tones of blue and violet, and there is further a green U. which is obtained in an intermediate stage of the manufacture. It is prepared by first dissolving silica in caustic soda, to which hydrate of alumina is then added in the proportion of 30 of alumina to 35 of silica. The mixture is dried and mixed with an equal weight of sublimed sulphur, and to this again is added a mixture of equal parts of sulphur and sodic carbonate, weighing as much as the silica and alumina mixture. The whole is then submitted for two hours to a red heat in closed crucibles, whereby green U. is produced, and this is again heated in crucibles till the desired blue hue is developed. U. is manufactured extensively in Germany, France, and Belgium; but of the total made in 1872, upwards of 8300 tons, nearly one-half was produced in Germany. See Vogelfang, *Naturliche Ultramarin-Verbindungen* (Bonn 1873).

Ultramon'tane (Lat. *ultra*, 'beyond,' and *montes*, 'mountains,' *i.e.*, the Alps) has changed its meaning since Bacon wrote in his *Observations on a Libel*:—'He is not papable, because he is an *ultramontane*, of which sort there hath been none these fifty years.' Then U. was used by Romans in reference to adherents of the Gallican Church (q. v.); now it is used by Europe in reference to Rome itself, and an Ultramontanist is one who implicitly accepts the dogma of papal infallibility. See ROMAN CATHOLIC CHURCH.

Ulwar'. See ALWUR.

Ul'verston, a town of Lancashire, England, on Morecambe Bay, 22 miles N.W. of Lancaster by rail. It has cotton, woollen, linen, and paper mills, and manufactures of gunpowder, besides a considerable export trade in the iron, copper, slate, and agricultural produce of the district. Pop. (1871) 7607.

Ulyss'es, Ulyx'es, or **Ulixes** (Latin forms of the Greek **Odyss'eus**), one of the heroes of the Trojan War, celebrated in song and story both by Greek and Latin writers, was, according to the Homeric account, king of the small Ionian isle of Ithaca. He was induced, though unwilling, to become one of the chiefs in the expedition against Troy, and greatly distinguished himself during the siege. When the city fell, U. and the band under his charge set out on their return home. Their adventures are narrated in the second great Homeric epic, the *Odyssey*. Shortly after their departure, they were driven on to the coast of Thrace by a storm. Then a N. wind blew them down the Ægean and across the Levant, till they came to the country of the Lotophagi, who subsisted on the lotus plant, the eating of which caused men to forget their homes and remain at rest. With difficulty U. rescued his companions from the lotus-lethargy, and sailed away to the island of the Cyclopes, a race of one-eyed monsters. Polyphemus, one of these, enclosed the adventurers in his cave, and ate several of them. U. made the giant drunk, burnt out his single eye, and got off by an ingenious stratagem. But his crew only escaped one danger to fall into another. At the island of Ææa, tenanted by the sorceress Circe, they were changed into swine. With the help of the god Hermes, U. re-transformed them, and the whole party were then amicably feasted by Circe, who directed the leader to descend to Hades and inquire of Tiresias, seer and poet, how he might get back to his home. After reaching the sunless land of the Cimmerians beyond the ocean-stream, U. made the descent and received prophetic encouragement. A second visit to Circe followed, and U. was warned of the perils in store for him and told how to escape them. Bound to the mast, whilst his companions with deafened ears rowed with all their might, U. heard undeluded the song of the Sirens (q. v.), and afterwards passed unharmed between Scylla and Charybdis. At the island of Thrinakia ('the trident-isle,' *i.e.*, Sicily) the sailors killed and eat the finest of the sacred oxen of Helios. As a punishment, they were all destroyed in a storm, with the exception of U., who, carried over the deep for ten days on some wreckage, was at last thrown on the isle of Ogygia, where he was hospitably received and entertained for eight years by the nymph Calypso. At last, on a raft, he continued his voyage, but was again wrecked and thrown on the island of Scheria (later Kerkyra, mod. Corfu), the king of which, having learned who he was, sent him home to Ithaca, which he reached after a twenty years' absence. During this time his wife Penelope had been courted by a number of island princes, who had made themselves free with the stores of the absent monarch. She had, however, remained true to him, and U., on his appearance, soon made short work of the insolent suitors, and resumed the rule of the island. The story of the hero has been made the subject of many disquisitions and moral interpretations; and it has been treated over and over again in all modern literatures. One later legend represents U. as again sailing to still remoter regions, inspired by an insatiable thirst for travel. This form of the story is treated in Tennyson's poem of U., which is an exquisite character-study of the old hero from a modern standpoint. The character, as represented in the old Greek tales, is by no means a perfect one. U. is brave, clever, and persevering; but he is cunning, deceitful, and treacherous. He is often represented as the Greek ideal of a man; and no doubt he may be taken as a popular ideal; but he is far below the ideal man of the higher Greek literature,—as we find him, for instance, represented in Plato. Of late, the romantic story of U. has been transformed into a solar myth. The hero's changeful adventures are 'the lights and shadows of a stormy and gloomy day;' his strong desire to see his wife and home again, which no allurement can permanently destroy, is, it seems, a symbol of Helios, 'who cannot turn aside from the course marked out for him, whether in his daily or his yearly round,' &c.

Uman', a town in Russia, government of Kiev, on the Umanka, an affluent of the Bug, 110 miles S.S.E. of Kiev. It has five churches and a synagogue, and has an active trade in farm produce. Pop. (1870) 15,393.

Umarkote'. See OMERKOTE.

Umball'ah (*Ambála*), the chief town of the district and division of the same name, in the Punjaub, British India, 120 miles N.N.W. of Delhi. Pop. (1868) 24,037, besides (1876) 26,659 in the cantonments, which lie a few miles to the S.E. It is a walled town with brick houses. The imports (excluding those by rail) are valued at £150,000; the exports at £70,000. U. is an important military station for all arms, and the railway station for Simla. It was the scene of the great *durbar* of 1869, when Lord Mayo in much state received Shere Ali, the late Ameer of Afghanistan. The *district* of U., which lies at the foot of the Himalayas between the Sutlej and Jumna rivers, has an area of 2621 sq. miles. Pop. (1868) 1,035,488. It is also watered by the W. Jumna Canal. The crops are wheat, millets, rice, gram, Indian corn, and barley.

Umbellif'eræ, an important order of calycifloral dicotyledons, containing about 150 genera and upwards of 1300 species, varying in size from very small plants to the most gigantic of the herbaceous category. The stems are round or furrowed, usually hollow, and solid at the nodes; the leaves alternate or compound, rarely simple. There is an inflorescence of usually regular and compound umbels, with an involucre of whorled bracts at the base of the primary rays, and of bracteoles at the secondary. The flowers are small, the calyx superior, limb none or five-toothed, the petals and stamens five, filaments incurved, and anthers versatile. The ovary is two-celled. The fruit consists of two indehiscent compressed carpels, each carpel

normally five- or ten-ridged, attached to and often pendulous from an entire or split slender axis (*carpophore*), the pericarp often traversed by oil-canals (*vittæ*). U. is one of the most natural and consequently one of the most easily recognised of the orders of plants, at the same time it is one of the most difficult for the systematic botanist to divide satisfactorily. It is prominently represented in N. Europe, N. and W. Asia, and N. Africa, being rarer in America, S. Africa, Australia, and tropical mountains. The properties are various. Thus we have (1) species with poisonous, acrid, watery sap in *Conium* (see HEMLOCK), *Cicuta* (see WATER HEMLOCK), *Œnanthe* (see WATER DROPWORT), *Æthusa* (see FOOL'S PARSLEY); (2) esculent species in Angelica, Celery (q. v.), Fennel (q. v.), Parsley (q. v.), Carrot (q. v.), Parsnip (q. v.), Samphire (q. v.), Skirrit (q. v), &c. (3) Such as yield gum-resin as Assafœteda (q. v.), Galbanum (q. v.), Opoponax (q. v.), Ammoniacum (q. v.). (4) Those containing an essential oil in their fruit, as Anise (q. v.), Dill (q. v.), Coriander (q. v.), Carraway and Cummin (q. v.).

Um'ber (Lat. *umbra*, 'a shade'), a pigment having various shades of brown and buff, consisting of a natural ochreous earth with some proportion of peroxide of manganese. The commercial varieties are known as Turkey U, raw and burnt, and English U., the latter being an artificial ochrey admixture.

Um'ber (*Scops umbretta*), a species of *Grallatorial* birds included in the heron family (*Ardeidæ*), having a compressed bill, and the tip of the upper mandible hooked. The furrow of the bill, in which are the nostrils, extends nearly the whole length of the bill. The average size of the U. is that of the common fowl. The name is derived from the colour of the plumage. The males are crested.

Umbey'la (*Ambeyla*), a mountain-pass on the N W. frontier of British India, leading N. from the district of Peshawar. The total length from the plain to the village of U., just beyond the crest, is about 11½ miles. The pass only permits an advance in Indian file, and is everywhere commanded by mountains 4000 feet high. It is celebrated as the scene of the U. campaign of 1863. Continual raids had rendered it again necessary to attack the fanatical colony of Mahommedans—Pathans and Hindustanees—who had in 1858 been expelled from Sitana. It was expected to be a mere expedition of three weeks, but Sir Neville Chamberlain, at the head of 9000 men, was practically blockaded in the U. pass from October 18 to December 16. The British casualties were 847 killed and wounded, while the enemy are said to have lost 3000. At last they broke up, owing to internal dissensions, and the rebel settlement at Mulkah, the object of the expedition, was burned. See *The Indian Mussulmans*, by W. W. Hunter (Lond. 1872).

Umbil'ical Cord, or **Na'vel String**, the structure passing from the *umbilicus* or *navel* of the *fœtus* or embryo of higher mammalia to the *placenta* or 'afterbirth,' and by means of the blood-vessels of which blood is conveyed to and from the maternal structures. The U. C. is developed about the end of the fifth month of pregnancy. It is composed of two *umbilical arteries* and a single umbilical vein united by a gelatinous tissue, the *gelatin of Wharton*. The average length of this cord is about 20 inches. The blood which is destined to nourish the *fœtus* passes from the placenta of the mother along the *umbilical vein*, which enters the abdomen of the fœtus at the umbilicus, whilst the umbilical arteries return the fœtal blood to the *Placenta* (q. v.). At birth the umbilical cord is severed, the bulk of the cord being cast off with the placenta.

U. C., in botany, is a name formerly used for the stalk by which the ovule or seed of a plant is attached to the Placenta (q. v.). It is now generally termed the funicle or funiculus (*funis*, 'a cord'). See OVULE and SEED.

Umbil'ical Her'nia occurs frequently as a congenital affection, the bowel protruding through the unclosed navel. The bowel should be kept reduced by a pad, which should cover the whole ring, and by careful attention for a few months a cure may be effected. In the adult, U. H. is frequently a result of obesity or of pregnancy. The hernia is covered only by the skin and expanded linea alba, and is generally reducible. When irreducible, the strangulation is more frequently due to the entanglement of distended bowel in the folds of omentum than to the presence of a constricting band; so that, when an operation is necessary, the bowel and omentum should be unravelled, and the finger passed beneath the ring to feel for the point of stricture. See HERNIA.

Um'bonate, a term in botany, meaning 'round,' with a projecting point in the centre, like the boss or *umbo* of an ancient shield; as the pileus of many species of *Agaricus*.

Um'breit, Friedrich Wilhelm Karl, a German theologian, born at Sonneborn, near Gotha, April 11, 1795, studied at Göttingen, and in 1820 was appointed professor of philosophy at Heidelberg, where with Ullman he founded (1828) the *Theologische Kritiken und Studien*, and in 1829 was transferred to the theological faculty. He died April 26, 1860. The chief works of U. are *Coheleth Scepticus de summo bono* (Gött. 1819), *Lied der Liebe* (2d ed. Heidelb. 1828), *Uebersetzung und Auslegung des Buches Hiob* (2d ed. Heidelb. 1832), *Kommentar über die Sprüche Salomo's* (ib. 1826), *Uebersetzung und Erklärung auserlesener Psalmen* (2d ed. Hamb. 1848), *De Veteris Testamenti Prophetis* (Heidelb. 1834), *Grundtöne des Alten Testaments* (ib. 1843), *Kommentar über die Propheten* (4 vols. 1841-46), *Neue Poesie aus dem Alten Testament* (1847), *Die Sünde* (1853), *Der Brief an die Römer* (1856).

Umbrell'a (Ital. *ombrello*, from Lat. *umbra*, 'a shade'), a familiar covered sliding frame, carried as a protection from the sun or rain. It had its origin in the East in very remote times, where it was regarded as an emblem of royalty or a mark of distinction. In Assyria the king alone used it; while in Egypt and India the privilege of carrying it extended to persons of quality. The title *Ch'hatra-pati*, or 'Lord of the U.,' was formerly much coveted by Mahratta princes; and the King of Burmah is pleased to style himself 'King of the White Elephant and Lord of the Twenty-four Umbrellas.' An U. of imposing dimensions is held as a mark of regal dignity in countries of Western Africa. The finials of Buddhist topes take their form from the U.; and a cardinal's hat is believed to be a modification of the U. suspended in Basilican churches at Rome. The Harleian MSS. show that the Old English of high degree used sunshades; but as a defence from rain the U. seems to have been first used in England early in the 18th c., and then only by ladies, as an idea of effeminacy was associated with it. The first man who (about 1750) had the hardihood to carry one habitually in London was Jonas Hanway, founder of the Magdalen Hospital. Oiled silk for covers, cane for 'stretchers,' and whalebone for 'ribs,' were the materials used in early umbrellas. Oiled silk was supplanted by gingham, and it in turn gave way to alpaca, silk, and mixed fabrics. Light frames of metal were introduced by Holland in 1840, and the trough-shaped 'paragon' ribs and stretchers by Fox in 1851. Metal furniture is principally made at Birmingham and Sheffield, while London and Manchester are the greatest seats of the making-up industry. The exports of umbrellas and parasols from the United Kingdom in 1877 amounted in value to £351,816.

Umbrell'a Bird (*Cephalopterus ornatus*), a species of *Conirostral* birds, allied to the Fruit Crows, and so named from the peculiar form of the crest borne on the head. This crest is composed of long and slender feathers, which slope backwards when at rest. In the erect position the shafts of the feathers radiate like the ribs of an umbrella, completely covering the head, and forming a dome of a beautiful blue colour. The breast bears a prominent 'tuft' of feathers, which appear to spring from a fleshy growth. The U. B. is a native of S. America, and has a local distribution. It attains the size of a crow, and its general colour is a rich glossy black.

Um'bria, one of the ancient divisions of Central Italy, lying between the Tiber and the Adriatic, varied somewhat in its boundaries at different periods, but as the sixth region of Augustus it was bounded S. by the Nar, the Central Apennines, and the Æsis, and N. by the Rubicon and an irregular mountain line extending to the sources of the Tiber. Beyond the Æsis lay Picenum, beyond the Rubicon, Gallia Cisalpina. Though deserving Martial's epithet 'montana,' U. contained several rich plains and not a few important towns, the ruins of one of which, Iguvium, has yielded remains of priceless value to ethnology. See EUGUBINE TABLES. The Via Flaminia ran through it from the valley of the Clitumnus at Forum Flaminii northwards to the Adriatic at Fanum Fortunæ, and formed

a most important military line. Of the products of U., vines, olives, and orchard trees are mentioned; but it was better known for its sheep, and especially its cattle. Of history apart from that of imperial Rome it has almost none; after its defeat in alliance with Etruria in B.C. 308, and another some twelve years later in the third Samnite war, it vanishes almost entirely from the pages of the Roman annalists, and the enfranchisement of B.C. 90 was earned rather than extorted. In pre-historic times, however, the Umbrians appear to have been the ruling people of Italy, and to have yielded the supremacy to the Etruscans even before the Romans seized it. Recent philological researches have made it probable that with the Oscans and Latins they formed a special branch of the Aryan family, distinct from both Teutonic and Celtic, though perhaps more closely allied to the latter than even to the Greek. See *Die Umbrischen Sprachen Denkmäler* (Berl. 1849), by Aufrecht and Kirchhoff, and *Umbrische Studien* (Berl. 1873), by Savelsberg.

Um'pire is properly the name given to a *third* arbitrator, called in to decide a question when the *two* previously appointed have failed to agree. The derivation of the word is uncertain.

U'mrer, a town in the district of Nagpur, Central Provinces, British India, 28 miles S.E. of Nagpur. Pop. (1872) 11,394. It has a considerable trade, being chiefly noted for its cotton goods with embroidered silk borders. There are 1150 looms, employing twice that number of journeymen, who receive from £1 to £2, 10s. per month.

Umritsur'. See AMRITSAR.

Unattached' or Non-Colle'giate Stu'dents, in the Universities of Oxford and Cambridge, are students who, under respective statutes of 1868 and 1869, are admitted members of the University without being attached to any college, hall, or hostel. At Oxford they are under the supervision of two 'Censors,' at Cambridge of the vice-chancellor and proctors; and at the latter University the Company of Clothmakers awards them three yearly scholarships of £50, tenable for three years. In 1878 the unattached students at Oxford numbered 256, at Cambridge 116.

Unau (*Cholœpus*), a well-known species of sloths or *Bradypodidæ*. Its fore feet are two-toed, and it has twenty-three pairs of ribs, this being the largest number found in the class *Mammalia*.

Unca'ria, a genus of climbing plants with hooked spines, belonging to the cinchona section of the natural order *Rubiaceæ*, natives of the E. Indies and tropical America. *U. gambir* is the most important, as yielding the gambier or *Terra Japonica* of commerce, a powerful astringent obtained by boiling the leaves of the plant and then evaporating the decoction until a thick residue results, which is moulded and dried in the sun. Gambir is used by the Malays in combination with areca-nut and betel-leaf as a masticatory. It is also shipped to China for tanning, and to Europe (principally from Singapore) for a similar purpose, serving as a substitute for catechu. Some botanists having united U. with the genus *Nauclia*, the name thus dropped was transferred by Burchall to the Grapple-Plant (q. v.) or *Harpagophytum*.

Un'cial Lett'ers (a name derived from a passage in Jerome in which he speaks of *literis uncialibus*, 'an inch long,' which, however, was probably written *initialibus*) is the name given to the characters, now regarded as capitals, in which the oldest Greek MSS. are written. The use of U. L., which are distinguished from the *cursive* or running hand by being formed separately, having no connection with each other, and in the earlier specimens without any spaces between the words, and with few marks of punctuation, prevailed from the 4th c. to the 10th c. (in liturgical books the 11th c.), when it was superseded by the *cursive*. The oldest form is square and upright; the later, narrow or leaning. See Scrivener's *Introd. to the Crit. of the New Test.* (Lond. 1861).

Unclean'ness. See PURIFICATION.

Unconform'able Stra'ta are such as do not lie regularly bedded in parallel planes, but the upper beds rest upon the upturned edges of the lower ones. This phenomenon is an evidence, doubtless, of the lapse of a long period of time between the deposition of the two sets of strata, during which period the first beds were consolidated, upheaved, and tilted from their horizontal position before the other series was laid down over them.

Un'ction (Lat. 'anointing with oil') is a practice perhaps reaching back to the rudest form of nature-worship. In the worship of the reproductive principle of nature, stone or wooden pillars (see ASHERA) were set up as rude forms of the Phallic symbol, and in further symbolism oil was poured on the top (*cf.* Gen. xxviii. 18). To this day in certain parts of India every village has its sacred stone, on which newly-married and barren women come and seat themselves after pouring oil on its top. But after the first rude meaning was lost, a sacredness continued to be attached to U. Thus among the Jews there was a holy anointing oil prepared with perfumes (Exod. xxx. 22-33), with which the priests, and the tabernacle, and all its furniture were anointed. Kings, too, were installed in their office by U., often seated on a sacred stone. It was considered to be efficacious even in healing the sick, and seems to have been used for this purpose in the early Church (*cf.* James v. 14). It soon came to be employed not only in this way (see EXTREME U.), and at the consecration of priests, but in all the principal sacraments.

Un'derclay, the bed of fire-clay which is almost invariably found beneath a seam of coal, and contains usually the peculiar fossil plant known as *Stigmaria*. It is now looked upon as the old soil in which the plants that formed the coal originally grew.

Un'derwriters, the name given to members of marine insurance companies, who being unable legally to take joint-stock because of the monopoly granted to the two chartered companies (the Royal Exchange and London), subscribed or *wrote under* their policies of insurance with the sums for which they severally bound themselves. The traditional system of underwriting still prevails, though co-ordinately with the privilege of companies which make it their business to grant marine insurance. See INSURANCE (Marine) and LLOYD'S.

Undines' (Lat. *unda*, 'a wave') were, according to the philosophy of Paracelsus, the spirits who inhabited the water. If a female spirit of this race married a man, and had a child, she received a soul. The history of the cares and sorrows of one of these imaginary beings forms the subject of an exquisite romance by La Motte Fouqué (q. v.), entitled *Undine*.

Un'dulatory The'ory of Light is the theory which regards the propagation of light as wave motion in a medium filling space. The possibility of light being propagated in waves was first propounded by Hooke in 1664; and the theory was a few years later applied by the Dutch philosopher Huygens to the explanation of several phenomena, such as double refraction. Newton, from as he thought its inability to explain other and more complex phenomena, did not accept this theory, but instead regarded light as being composed of minute corpuscles radiating from the luminous source in straight lines and with a great but constant velocity. It does not appear, however, that Newton had formed a definite theory; he merely gave possible explanations of different phenomena, explanations based upon extremely ingenious hypotheses, each of which applied to a certain group of phenomena and no other. Such a collection of arbitrary assumptions could scarcely have been regarded as a scientific theory by their author; but that it should have long lived as *Newton's Theory* is not surprising when it is remembered what an authority Newton was and is on all physical questions. The earlier partisans of the undulatory theory were no better, as regards the assumptions they made and the explanations they gave, than were their opponents the supporters of the emission theory; and not till Young and Fresnel attacked the question did the undulatory theory acquire the simplicity and efficacy which are essential to all true scientific theories. Fresnel especially, by his wonderful mathematical analysis, has placed the theory upon a sure basis; and the theory further commends itself inasmuch as it has predicted phenomena which were not before suspected.

The general nature of wave-motion is explained under the article WAVE; here we purpose to consider the special peculiarities characterising the ethereal undulations which constitute light and other forms of radiant energy. We know nothing of

the luminiferous ether except that it is so highly elastic that at any given portion through which radiant energy is being transmitted, a great number of waves differing in all their elements may co-exist. By suitable means we may experimentally separate these different rays, as when we obtain a spectrum (see SPECTRUM ANALYSIS). The simple geometry of wave-motion involves of necessity the well-known laws of reflection and refraction; and the possibility of obtaining a spectrum proves that in an ordinary ray of sun-light waves of nearly all lengths and refrangibilities between certain limits exist. Those of longest wave-length and least refrangibility are the invisible heat-rays; when the wave-length becomes ·0000266 of an inch, the ray becomes visible and appears of a dark red. This is the lower limit of visibility, and from this to the extreme purple ray whose wave-length is ·0000167 of an inch there are rays of intermediate wave-lengths, each of which has its own refrangibility and characteristic colour sensation. Beyond this limit there are other rays, which, though too fine to be directly perceptible to our organs of vision, may be studied by their action upon certain sensitive substances, such as are employed in photography, or are included under the class of fluorescent substances. It is thus apparent that in general a light wave is intensely heterogeneous, and that we can so easily separate its various components is due to the minuteness of the corresponding vibrations. These vibrations, however, are not so minute that we can wholly neglect their mutual interference; and to this phenomenon, by means of which Helmholtz has so successfully explained the consonance of musical chords, we must look for the explanation of dispersion. In many of its phenomena light naturally bears a close analogy to sound, since both are propagated by wave-motion. There is a whole group of phenomena, however, included under the name Polarisation (q. v.), which are peculiar to light and the other forms of ethereal radiant energy. To explain these phenomena it is necessary to assume that the luminiferous medium vibrates in a direction at right angles to the direction in which the ray is propagated. The undulations of ordinary unpolarised light are then supposed to take place in all planes passing through the axis of the ray, so that in any finite time the eye receives as many vibrations in one plane as another. When, however, the ray is a plane polarised ray, the vibrations all take place in a definite plane, which, according to Stokes, is perpendicular to the so-called plane of polarisation. The whole theory of circular, elliptical, and rotatory polarisation, then becomes an application of the well-known kinematical principles which regulate the composition of simple harmonic motions. One of the most beautiful developments of the undulatory theory is Fresnel's theory of double refraction. Light radiating from a single luminous source in a medium which has the same elasticity in every direction will propagate itself in spherical waves. If, however, the elasticity of the medium is different for different directions, the wave surface will evidently not be a sphere, and light will be propagated with different velocities in different ways. The resultant of the elastic forces resisting any displacement at any point will not in general act in the direction of the displacement; but Fresnel showed that in accordance with the first principles of crystallisation there must be three directions in every elastic medium in which these forces do act in the direction of the displacement. Assuming these directions to be parallel throughout the crystalline medium, he called them the *axes of elasticity*, and was then led to the construction in the crystal of a geometrical surface, the length of each radius of which was proportional to the velocity of propagation of light in its direction. This surface is of the fourth order, and its semi-axes, which are coincident with the axes of elasticity, are proportional to the elasticities in their directions. Now, conceive an ellipsoid with the same semi-axes, and let it be cut in any diametrical plane. At the centre of this section let perpendiculars be raised whose lengths are equal to the greatest and least radii of the section, then Fresnel showed that the loci of the extremities of these perpendiculars determined the form of the wave diverging from any point within the crystal. There are two directions, namely, the normals to the circular sections of the ellipsoid, in which the two sheets of the wave surface meet, and therefore the two rays have the same velocity; and these directions are the true optic axes of the crystal. For uniaxal crystals two elasticities are equal, and the ellipsoid becomes a spheroid, so that Huygens' famous construction for the extraordinary ray is a particular case of Fresnel's general theorem; and when the three elasticities are equal in all directions, the ellipsoid becomes a sphere and the velocity is the same in all directions. For a clear exposition of the whole theory and for Sir W. R. Hamilton's later developments, the reader is referred to Lloyd's *Wave Theory of Light* (3d ed. 1873). See also DIFFRACTION, INTERFERENCE, POLARISATION, &c., for more detailed treatment of special parts of the subject.

Unferment'ed Bread. See AERATED BREAD and BREAD.

Unferment'ed Wine Agita'tion, a disturbance which originated in the dissenting communities in Scotland caused by some extreme abstainers, who insisted that communion wine must be administered free from alcohol. The agitation has not been received with much favour by the public, but it cannot be said to have wholly died away.

Unghvar', a town of Hungary, in a district of the same name, on the river Ungh, a sub-affluent of the Theiss, 195 miles E.N.E. of Pesth by rail. The seat of a Greek bishop, it has a beautiful church, and a castle of great antiquity. There is considerable trade in rye, oats, hemp, cattle, and wine. Pop. (1870) 11,017.

Un'guents. See OINTMENTS.

Unguicula'ta ('clawed'), a term formerly employed in zoology to designate those animals in which the nails were developed to form prominent *claws*. Under this name Linnæus included Edentates, Rodents, Felidæ, and other quadrupeds. Cuvier extended the term to those animals having well-developed 'nails,' such as man, quadrumana, &c.

Ungula'ta, a large and important order of *Mammalia* or quadrupeds, embodying the sub-orders Ruminantia, Pachydermata, and Solipeda of former systems of classification. They are popularly known as 'hoofed' quadrupeds, from the toes being encased in largely-developed nails, called 'hoofs.' Three new sub-orders have replaced the groups mentioned above. These are the *Artiodactyla*, *Perissodactyla*, and *Proboscidea*. Some authorities, however, regard the Proboscidea as a distinct order of Mammalia. The general characteristics of the *Ungulata*, as an order, are sufficiently clear and distinct. The limbs are always four in number, and the perfect and functional toes are never more than four to each limb. Clavicles are absent throughout the group, the limbs being used solely for locomotion.

U'nicorn. The belief in the existence of a wild animal in form similar to the horse, with a single formidable horn projecting straight and pointed from the middle of its forehead, is very old and widely diffused. Ctesias, Aelian, Aristotle, and Pliny describe such an animal, but confess they never saw it. Its reputed home was now India, now Africa; and in collections the great tooth of the Narwhal (q. v.) was shown as the horn of the U. But the last two thousand years furnish no trustworthy evidence of a U. having at any time been observed, and anatomists show that its existence is *a priori* most improbable. The belief is probably to be traced to rude drawings in profile of certain straight-horned antelopes. The 'U.' of the English Bible (Vulg. *unicornis*, LXX. *monokerōs*) is an unhappy rendering of the Heb. *Reēm*, which Gesenius, following Alb. Schultens, 'without hesitation identifies with the *buffalo*.' The Supporters (q. v.) of the present Shield Royal—a *lion or* for England and a *U. argent* for Scotland—were introduced by James I., who had previously, as King of Scotland, borne *two unicorns*.

U'niform ('one form'), in its military sense, a particular kind of dress indicative of regiment and rank, was first introduced 'in a regular manner' in the French army, but not till the time of Louis XV. (about 1668). A U. was shortly afterwards adopted in the British army, in which red is the prevailing colour, as blue is in that of France and Germany, and white in that of Austria. A similar regulation respecting 'the cloth' was only introduced into the British naval service in 1748.

Uniform'ity, Act of. See ACT OF UNIFORMITY.

Unigen'itus, Bull. See JANSENISM.

Union City, a town of Pennsylvania, U.S., 23 miles S.E. of Erie by rail, has 4 churches, 3 banks, and 3 newspapers.

It has 2 flour-mills, 2 carriage and several furniture and other wood works, and a large tannery. Pop. (1870) 3400.—U. is also a township of Ohio. Pop. (1870) 5399.

Union Coll'ege, an educational institution of Schenectady, New York, U.S., comprises one faculty with twelve teachers and two tutors. There are two courses of study, a classical and a scientific, the latter being well supplied with apparatus of practical study. In 1872 it was affiliated with the Albany Medical and Law Schools of Albany University, the joint corporation taking the name of Union University. New buildings are now in progress. Four thousand alumni have left this college. U. C. was incorporated in 1795 through the efforts of General Schuyler, but owes most to the Rev. Eliphalet Nott, president from 1804 till 1865.

Union'idæ. See FRESHWATER MUSSEL.

Union Jack', the national flag of Great Britain and Ireland, consisting of a blue ground on which are displayed the red cross of St. George and the white and red diagonal crosses of St. Andrew and St. Patrick, the latter two being placed contiguously. The old English flag, the banner of St. George, white with a red cross, was in 1606 incorporated with the banner of Scotland, blue with white diagonal cross, in allusion to the union of the two kingdoms. This was proclaimed the national flag of Great Britain, 28th July 1707, but on the union with Ireland, the cross of St. Patrick, white with a diagonal red cross, was introduced, having its four limbs edged on one side with white. The latter part of the name was originally that of the *jacque* or surcoat, charged with a red cross, anciently worn by English soldiers (see JACK). In addition to its general use as a national flag, it is employed in the naval service, being placed in the upper quarter (next the mast), of the red, blue, and white ensigns. Far from defensible as a heraldic device, the banner is endeared to the nation by a thousand associations of heroism and pathos, and is universally regarded as an emblem of liberty.

U'nions, a trade term applied to textile fabrics composed of more than one kind of fibre, but principally to such as are made up of varied combinations of cotton, flax, jute, and hemp.

U'nit. Every quantity consists of two parts, a numerical and a denominational part. The former is a number whole or fractional, the latter is the name of a thing of the same kind as the quantity to be expressed, and of a certain definite magnitude. Thus three feet, twenty pounds, and sixty seconds, are examples of quantities whose *numerics* are three, twenty, and sixty respectively. The denominational parts, which are necessary for the complete determination of the quantities, are the foot, the pound, and the second. When the numeric is *one*, the quantity is the standard quantity itself, and a quantity of which the numeric is unity is called a *unit*. In the examples given above, the foot, pound, and second are evidently the chosen units. We may use different units of the same kind, as when we speak of one yard, three feet, or thirty-six inches. Here all these express the same quantity, but the numerics are different, because different units are chosen. To express in terms of one U. a quantity which is given in terms of another, we must multiply the original quantity by the number of times which the former U. is contained in the latter. Thus, since there are twelve inches in a foot, to express three feet in inches we must multiply the numeric by twelve, expressing the quantity as thirty-six inches. If any quantities of the same kind are to be compared, we must express both in terms of the same U. Many quantities can be expressed in terms of units of a different kind. In this case we make use of derived units. Thus taking the U. of length as a foot, areas are expressed in terms of the square whose side is unity, and volumes in terms of the cube whose side is unity. Velocities being expressed as so many feet per second involves the time U., and by defining U. velocity as U. space described in U. time, the mathematical treatment of velocities is much simplified. The measurement of force involves, besides the length and time units, another U.—that of mass; and in terms of these fundamental units all physical quantities by proper definition can be expressed. See DYNAMICS, ENERGY, FORCE, VELOCITY, &c.

Unita'rians are properly those who believe in one God; but the name is somewhat misleading, since we might include Jews, Christians, and Mahommedans under this head. It is specially used, however, to distinguish those who may be considered within the pale of the Christian Church, but who reject the doctrine of the Trinity, believing that Christ was man and not God. Thus they are called U. in opposition to Trinitarians, though perhaps anti-Trinitarians would be a more correct name. In considering Unitarianism we shall, first, trace the history of the opinion, and, second, state the form it generally takes in our own time. 1. *History*.—The thing though not the name is found at a very early period of the Christian era. The doctrine was taught by Theodotus, a leather-seller of Byzantium, Artemon of Rome, and Beryllus, Bishop of Bostra. Paul of Samosata, in the 3d. c., is, however, the most famous of the early heretics, some of whom were distinguished as *Patripassians* (q. v.), and others, the great majority, as *Monarchians* (Gr. believers in a 'single rule' or 'government' of the universe). In the *Arianism* (see ARIUS) of the 4th c. we recognise a doctrine not very different from that of the U., but we must come to post-reformation times before the full development of the U. as a distinct sect is seen. It is true that men substantially holding their opinions were never absent from the Church, but during the Middle Ages the central papal force was strong; speculative tendencies were kept within narrow bounds; knowledge was confined to a few; and any departure by a large body of men from the recognised creed of the Church was well-nigh an impossibility. The *Revival of Letters* worked a revolution; and so, after the Reformation, the position of things became entirely reversed. Unitarianism, under the name of Socinianism (see SOCINUS), immediately appeared as a definite creed with a huge body of doctrine. But Roman Catholics and Protestants, if they agreed in nothing else, agreed in persecuting it, and the U. of the 16th c. fled from the tortures of the Inquisition only to find Genevan preachers eager to condemn them to the stake (see SERVETUS). In this extremity they took refuge in Poland, where they soon became a large and powerful sect. They gained over a considerable number of the nobility to their cause, published a large number of writings distinguished by learning and acuteness, and 'for ten years freely pursued their inquiries within the pale of the Reformed Church.' But on the accession of Sigismund III. all was changed; in a short time the U. were driven with ignominy from the kingdom. They were exposed to unusual persecution over the Continent, and by the end of the 17th c. they existed in Transylvania alone. Here they took firm hold, and have continued down to our own time. In 1871 there were in that part of Europe 106 congregations with 50,000 members. In England and America the U. have had brighter fortunes. The period just before and just after the Reformation is disgraced by the burning of several persons who denied the doctrine of the deity of Christ. When these proceedings fell into disuse, Convocation took occasion frequently to condemn the doctrines of the U. During the 18th c., the century alike of indifference and toleration, these doctrines were openly avowed; and a long succession of able writers, Bury, Whitson, Samuel Clarke, Whitby, Emlyn, Priestley, and Belsham argued for this form of Christian doctrine. The present Unitarian chapels in England originally belonged for the most part to the Presbyterian or other Nonconformists who seceded from the English Church on disagreements regarding ecclesiastical government. In point of doctrine these Nonconformists were at first quite as 'orthodox' as the Church which they left, but they were bound by no distinct specific creed, and gradually lapsed into Unitarianism. Their mode of Church government is practically Congregational, since each congregation is independent of all others. In 1871 there were in England and Wales about 380 congregations and mission stations. In Scotland, where Unitarianism has never prospered (though during the 18th c. Socinianism had invaded the National Church to some extent), there are only (1879) eight congregations, and these are for the most part socially powerless. In America the U. are very strong as a separate sect. Those who held the doctrine in England communicated it to America. We may look upon 1756, when Embyn's *Humble Inquiry into the Scripture Account of Jesus Christ* was republished in Boston, as the date of the establishment of Unitarianism as a sect in the New World. It is to a native-born American writer, the famous Dr. Channing (q. v.), that we must look for the consolidation of the American U. His undoubted genius, his fervid eloquence, and still more his high moral character, gave him an almost unbounded influence that lasted longer than his lifetime. Under his leadership several hundred congregations separated themselves from the 'Orthodox

Congregationalists.' In 1871 there were in the States 335 societies with 306 ministers, and in connection with these a large number of active societies and institutes, and several vigorously conducted periodicals. It only remains to add that the greatest names in later Unitarianism are James Martineau (q.v.), President of Manchester New College in London (an institution so free from sectarian bias that it can hardly be exclusively claimed by U.), and Theodore Parker (q. v.) of America. 2. *Doctrine.* It must not be supposed that U. are agreed as to one general body of doctrine. Indeed, there are almost as many differences of opinion among them as among Trinitarians. The name is only a general term for those who, while wishing to retain the name of Christian, refuse to accept the doctrine of the godhead of Christ. Generally, they may be divided into the two following parties. (1.) The conservative U. These receive the general articles of the Christian creed (the Trinity of course excepted). Thus, they believe in miracles, in the resurrection of Christ, in the plenary inspiration of Scripture. Their number is gradually diminishing. In denying the Trinity they principally found upon Scripture argument. (2). The liberal or progressive U. The creed of these U. is purely rationalistic. Christ they consider to have been a mere man—inspired as Socrates was, undoubtedly to a greater degree, but not in a different manner. They reject the miracles and generally the whole supernatural element in Christianity. The Bible they use as a religious text-book, because they consider that it contains the highest expression of the ever-true and permanent religion of humanity. What rites of Christianity (as Baptism and the Lord's Supper) some of them retain, is partly from old association, and partly because they have gradually infused into these a naturalistic meaning. These are probably the majority of U., if not in mere numbers (though perhaps also in this), at least in intellect and position. Although the U. as a separate sect are not prominent on the Continent, this is owing to the fact that their doctrines are so widespread, or the opposition to them is so weak, that they have not been obliged to separate themselves from the Established Churches of the country. The liberal clergy of the Protestant churches of Germany, France, and Holland are really U. in everything except the name. This is not the case in England or Scotland, for the 'Broad Church' party has hitherto rejected special Unitarian doctrines. See Lange, *Geschichte und Lehrbegriff der Unitarier vor der Nicanish. Synode* (Leip. 1831); Meier, *Die Lehre von der Trinitat* (Ham. and Gotha 1844); and J. F. Trechsel, *Die Protest, Antitrinitarier von F. Socin.* For an account of modern Unitarianism, see Beard's *Unitarianism Exhibited* (Lond. 1860); Ellis' *Half Century of Unitarianism* (Lond. 1860); and Orr's *Unitarianism in the Present Time* (Boston 1863).

Uni'ted Presbyte'rian Church. The foundation of this Church was laid in the Secession Church, which was formed on the deposition of Ebenezer Erskine (q. v.) in 1733. The immediate cause of this rupture was the restoration of lay patronage in the Church of Scotland by the Act of Queen Anne (1712). Many of the laity were greatly irritated by the forcible settlement among them of unpopular ministers. Appeals from the Presbyteries which inducted those men to the higher Church Courts had seldom any effect, and at last the General Assembly enacted (1730) that no reasons of dissent against the determinations of Church judicatures should be recorded. This Act Erskine and his friends considered calculated to encourage and increase errors of discipline and doctrine, and being prevented from recording his opposition to it in the minutes of Assembly, he denounced it and the general defections of the Church in his public ministrations, and more particularly in his sermon as Moderator of the Synod of Perth and Stirling (October 1732). Being censured first by the Synod and then by the Assembly, and refusing to submit, he and three other ministers were deposed in 1733, leaving on the table of the Assembly, however, a protest that they *seceded* from the Church because 'the prevailing party in it were carrying on a course of defection from her reformed and covenanted principles.' This was the surface history of the rupture, but the real beginning of the variance is to be traced to the Marrow Controversy (q. v.). Erskine was one of the Marrow Men, who drew up a representation in opposition to the report of the Committee of the Assembly of 1720. But this again was only one indication of the antagonism between the two parties—the Evangelical and the Moderate—which arose in the Church after the Revolution. The Secession Church was formed when the deposed ministers were finally ejected from their churches in 1740.

In 1745 the Secession, which then numbered 46 congregations, formed itself into a Synod; but the prosperity of the church was greatly hindered by a controversy which arose regarding the lawfulness of taking the burgess oath; and a division took place (1747) into the Associate Synod, popularly known as the Burghers, because they allowed their members to take the burgess oath, and the General Associate Synod, or Anti-Burghers, who objected to it. These two sects were again subdivided into four—the former (1799) into the Old Light (or Constitutional party) and New Light Burghers; the latter (1806) into the Old Light and New Light Anti-Burghers. It was the New Light sections of the two parties which united in 1820 to form the United Secession, while the Old Light sections united (1842) as the Original Seceders.

Meantime, in 1752, another Secession had taken place from the Established Church. The Presbytery of Dunfermline had refused to induct a minister who had been presented (1749) to the parish of Inverkeithing, and against whose settlement the majority of the parishioners had protested. The General Assembly (1752) enjoined the Presbytery to proceed with the induction, but six ministers, including the Rev. T. Gillespie of Carnock, absented themselves, whereupon Gillespie was deposed. In 1761 he and Mr. Boston of Jedburgh, and Mr. Collier of Colinsburgh, formed themselves into a presbytery for the purpose of 'giving relief from the yoke of patronage and the tyranny of the Church Courts;' hence the church thus founded was called the Relief Church. By its union with the United Secession in 1847 was formed the U. P. C.

Other schemes of union have since been inaugurated, with more or less of success. In 1863, stimulated by movements in the colonies, a great 'union movement' was begun, to unite the four chief nonconforming bodies in Scotland—the Free Church (q. v.), which had come into existence at the 'Disruption' of 1843, which was the climax of the antagonism between the Evangelicals and the Moderates; the Reformed Presbyterians (see CAMERONIANS); the Original Secession; and the U. P. C. The union between the Free Church and the Reformed Presbyterians was consummated in 1878. That between the Free Church and the U. P. C. is at present postponed, the great obstruction being the 'Voluntary' principle held by the latter. The difference between the two on this point was expressed by one of the Free Church leaders, in a debate on the Union in May 1867, thus:—'We believe that a lawful and scriptural Church Establishment is theoretically possible, whereas our United Presbyterian friends are of opinion that under no circumstances and no conditions ought such an arrangement to take place.' In 1873 a majority of the Free Church Assembly were in favour of the union, but there was a vehement minority, which announced that if the union scheme were carried, they would secede, declare themselves the true Free Church, and claim the whole property of the Church in the civil courts. Under pressure of this policy the union scheme was put aside, and one of 'mutual eligibility' substituted for it. This means that U. P. ministers are eligible as pastors of Free Church congregations, and Free Church ministers as pastors of U. P. congregations; the effect of which is to permit a transfer of ministers from the one Church to the other, and practically to defeat the opponents of union.

The manner in which Voluntaryism has taken an increasingly firm hold on the mind of a certain portion of the people is a curious phase of Scottish church history. The original ground of dissent was a regard for the Church's honour and faithfulness. It was this that led the Seceders of 1733 to separate from the majority of the Church: a passion for Church purity, as well as for Church independence. But as time passed on the latter principle acquired pre-eminence. In the secession of 1752 it is almost entirely the spirituality of the Church, and its freedom from State control, of which we hear. The older seceders regarded the evils against which they kicked as merely abuses in the Church; the later ones came to regard them as more or less essential to the very existence of an Establishment. This was the 'New Light' which came among them, and those who received it became *voluntary.* Now, a great controversy raged at the beginning of this century between this party out-

side the Church, and the spiritual independence party inside the Church, who considered it quite consistent with their principles to remain where they were. Accordingly, when the Free Church was formed by this latter party, its principles were most distinctly and emphatically declared to be opposed to Voluntaryism. And we have seen that this very point was the great obstacle in the way of a union with the U. P. C. But since 1863 'New Light' has been coming to the Free Church, as formerly to the Burghers and Anti-Burghers, and it would seem as if before long the Free Church will be the same as the U. P. C. except in name. Along with the principle of Voluntaryism, there has gradually grown up in the U. P. C. a disposition to allow for differences of opinion within certain definite limits. In 1877 a Committee was appointed to consider the subject of the standards, and in 1878 recommended that a declaratory statement should precede the questions of the formula; this recommendation is still under consideration. In 1878 an important change took place in the curriculum of theological study: instead of an autumnal session of two months, a winter and spring session of six months, and professors were appointed who were relieved of all pastoral duty. In 1878 the U. P. C. numbered 534 congregations, and 173,554 members; and its foreign mission fields were occupied by 63 missionaries. In the same year the total sum raised by the Church for all religious and ecclesiastical purposes was £379,079. See Ferrier's *Memoirs of W. Wilson*, *Lives of the Erskines*, and *Histories of the Secession and Relief Churches*, by the Rev. Dr. Andrew Thomson.

Uni'ted Prov'inces. See NETHERLANDS.

Uni'ted States, The, the 'Great Republic,' occupying the central portion of the continent of N. America, and extending from the Atlantic Ocean to the Pacific, ranks fourth (after the Russian, British, and Chinese empires) among the states of the world in respect of area and of population. It consists of 38 sovereign and independent states, 1 federal district, and 9 territories not yet ranked as states, in consequence either of insufficient population, or from want of conformity to the requirements of the Constitution of the U.S.

Boundaries.—The U.S. are bounded on the N. by British N. America, the boundary-line running through the Strait of Juan de Fuca to the S. of Vancouver's Island, but to the N. of the island of San Juan (see SAN JUAN BOUNDARY QUESTION), striking the mainland at the 49th parallel and running along that parallel to the Lake of the Woods, and thence by a devious route through the great lakes and along the Laurentian watershed to the St. John's and St. Croix rivers and Fundy Bay. The land boundary is a clearing 30 feet wide, with iron mile-posts 4 feet high painted white. The eastern and western boundaries are formed by the Atlantic and Pacific Oceans respectively, the southern boundary by the Gulf of Mexico, the Rio Grande del Norte up to the 32d parallel, and a broken line drawn between the 31st and 33d parallels to the Pacific, separating the U.S. from Mexico. These boundaries do not include Alaska.

Area, Population, and Divisions.—The total area of the U.S., inclusive of Alaska, purchased from Russia in 1867, is 3,603,884 sq. miles. Of these, 1,272,239 sq. miles were actually settled (*i.e.*, possessed two or more inhabitants to the sq. mile) in 1870, as against 508,717 sq. miles in 1820, and 239,935 sq. miles in 1790. The pop. in 1870 amounted to 38,558,371, of whom 4,880,009 were negroes, 63,254 Chinese, and 25,731 Indians. In 1770 the pop. was estimated at 2,312,000, including 462,000 negroes; in 1820 it was 9,633,822, including 1,771,656 negroes; in 1850 it was 23,191,876, including 3,638,808 negroes; and in 1860 it was 31,443,321, including 4,441,830 negroes, 34,933 Chinese, and 44,021 Indians. In 1876 the pop. of Alaska was estimated at 27,500, and the occupants of the Indian territories numbered 383,712, while of undomesticated Indians maintaining tribal relations there were probably about 200,000. The average pop. per sq. mile of the U.S. was, in 1870, 10·70, while the average per sq. mile of the settled districts was 30·2; thus even if we take the settled districts only, the density of population is comparatively very small, that of European Russia being 34 per sq. mile, of Germany 201, of England and Wales 238, and of Belgium 469. Of foreign-born persons settled in the U.S. there were, in 1870, 5,567,229, of whom Austria contributed 30,508, Belgium 12,553, Bohemia 40,289, British America 493,464, Denmark 30,107, France 116,402, Germany 1,690,533, Great Britain and Ireland 2,626,241, Holland 46,802, Italy 17,157, Mexico 42,435, Norway 114,246, Poland 14,436, Sweden 97,332, Switzerland 75,153. The aggregate immigration in 1820-40 was 750,949; in 1841-50, 1,713,251; in 1851-60, 2,598,214; in 1861-70, 2,491,451; and in 1871-78, 2,177,108. During the period covered by these statistics the nationality of the aggregate immigrants was as follows:—English, Irish, Scotch, and Welsh, 4,601,539; German, 2,945,967; French, 309,544; Scandinavian, 323,556; Swiss, 80,719; Italians, 64,881; Austrians, 59,859; Spanish and Portuguese, 36,022; Russians and Poles, 49,343; Dutch, 43,383; Belgians, 22,219; Anglo-Americans, 517,153; West Indians, 61,915; Mexicans, 24,329; Chinese, 216,662; Japanese, 343; and Australians, 8708. The number of emigrants who had returned to the countries from whence they came in the eleven years 1868–78 (both inclusive) was 566,964; the number of immigrants for the same years being 3,199,268—17·7 per cent. therefore returning to their homes. Of the outgoing emigrants one-ninth are from San Francisco, mostly returning Chinese. From New York about three-fifths of the whole take their departure. The effort made in 1879 to restrict the immigration of the Chinese proved abortive, as it was proved to be a violation of treaty, and was, moreover, unnecessary, since the Chinese were largely returning to China. The whole pop. of the U.S. on July 1, 1878, was officially estimated at 47,874,485.

In the following table the states in which slavery existed up to the general emancipation (December 18, 1865) are in italics. The district of Columbia, formed in 1790, is called federal, because it belongs to and contains the capital of the whole Republic. The states which joined the Union after its formation by the original 13 states in 1787, are followed in the table by the respective dates of their admission.

STATES.	Area in sq. miles	Pop. in 1870.	Estimated Pop. in 1879.	CAPITALS.
FEDERAL DISTRICT—				
Columbia	64	131,700	195,000	Washington.
NEW ENGLAND—				
Maine (1820)	35,000	626,915	630,000	Augusta.
New Hampshire	9,280	318,300	318,000	Concord.
Vermont (1791)	10,212	330,551	330,000	Montpelier.
Massachusetts	7,800	1,457,351	1,821,000	Boston.
Rhode Island	1,306	217,353	290,000	Providence and Newport.
Connecticut	4,750	537,454	620,000	Hartford.
NORTHERN—				
New York	47,000	4,382,759	4,905,000	Albany.
New Jersey	8,320	906,096	1,130,000	Trenton.
Pennsylvania	46,000	3,521,951	4,125,000	Harrisburg.
Ohio (1802)	39,964	2,665,260	3,120,000	Columbus.
Michigan (1837)	56,451	1,184,059	1,512,000	Lansing.
Wisconsin (1848)	53,924	1,054,670	1,409,000	Madison.
Minnesota (1857)	83,531	439,706	753,000	St. Paul.
MIDDLE—				
Delaware	2,120	125,015	140,000	Dover.
Maryland	11,124	780,894	850,000	Annapolis.
Virginia	38,348	1,225,163	1,295,000	Richmond.
W. Virginia (1863)	23,000	442,014	508,000	Charleston.
N. Carolina	50,704	1,071,361	1,160,000	Raleigh.
Kentucky (1792)	37,680	1,321,011	1,490,000	Frankfort.
Tennessee (1796)	45,600	1,258,520	1,385,000	Nashville
SOUTHERN—				
S. Carolina	34,000	705,606	951,000	Columbia.
Georgia	58,000	1,184,109	1,372,000	Atlanta.
Florida (1845)	59,268	187,748	243,000	Tallahassee.
Alabama (1819)	50,722	996,992	1,148,000	Montgomery.
Mississippi (1817)	47,156	827,922	986,000	Jackson.
Louisiana (1812)	41,346	726,915	964,000	New Orleans.
Texas (1845)	274,356	818,759	1,583,000	Austin.
CENTRAL—				
Indiana (1816)	33,809	1,680,637	2,045,000	Indianopolis.
Illinois (1818)	55,410	2,539,981	3,486,000	Springfield.
Iowa (1846)	55,045	1,194,020	1,673,000	Des Moines.
Missouri (1821)	65,350	1,721,295	2,305,000	Jefferson city.
Arkansas (1836)	52,198	484,471	681,000	Little Rock.
Kansas (1861)	81,318	364,399	707,000	Topeka.
Nebraska (1864)	75,995	122,993	485,000	Lincoln.
Colorado (1876)	104,500	39,864	209,000	Denver.
WESTERN—				
California (1850)	188,981	560,247	756,000	Sacramento.
Oregon (1859)	95,274	90,923	112,000	Salem.
Nevada (1864)	104,125	42,491	86,500	Carson city.
	2,084,031	38,281,205	47,870,500	

The following is a table of the Territories, exclusive of Alaska (q. v.) and of the Indian Territory (q. v.).

Territories.	Organised.	Area in sq. miles.	Pop. in 1870.
New Mexico	1850	121,201	91,874
Utah	1850	84,476	86,786
Washington	1853	69,994	23,955
Montana	1864	143,776	20,595
Idaho	1863	86,294	14.999
Arizona	1863	113,916	9,658
Wyoming	1868	97,883	9,118
Dakota	1861-68	155,932	14.181
		873,472	271,166

Physical Aspect.—The two great mountain systems of the U. S. are the Appalachians (q. v.) and the Rocky Mountains (q. v.). The former extend from the mouth of the St. Lawrence to the mouth of the Mississippi—a distance of 1300 miles—and at the south bend inland, leaving the wide and rich seaboard of Virginia, the Carolinas, Georgia, Alabama, and Florida. This maritime region includes all the older states, and its inhabitants still amount to one-third of the whole. As far S. as the Hudson River it is hilly; thence, as far as the Alleghanies extend, its surface is divided between a plain and a mountain-slope, the base of which appears to have been the shore of an ancient sea. The most fertile part of this slope is between Long Island and the Potomac. The coast to the Mississippi is sandy throughout; from Long Island to N. Carolina it is marshy only close to the sea, but farther S. the seaward half of the plain is covered with swamps. The Appalachians form the watershed between the rivers draining into the Atlantic and the tributaries of the Mississippi, though some of the former may be said to rise on the inland side of the mountains, and to force a passage through them to the sea. The principal rivers falling into the Atlantic are the Penobscot, Kennebec, Merrimac, Connecticut, Hudson, Delaware, Susquehanna, Potomac, Rappahannock, James, Roanoke, Pedee, Santee, Savannah, and Altamaha. The Chattahoochee and the Flint River joining form the Appalachicola; the Alabama and Tombigbee, the Mobile; these drain into the Gulf of Mexico E. of the Mississippi. The great central plains and prairies between the Appalachians and the Rocky Mountains are drained almost entirely by the Mississippi (q. v.) and its affluents, chief of which are the Ohio, Tennessee, Missouri (q. v.), Arkansas, and Red River. The only other river of great importance flowing into the Gulf of Mexico is the great boundary river, the Rio Grande del Norte. The streams flowing N. are trifling, the principal being the Red River of the North, which flows into Lake Winnipeg. Almost the whole of the Mississippi basin consists of open, rolling prairies (see PRAIRIE), while, on the other hand, almost all the country beween the Appalachians and the Atlantic was originally more or less thickly wooded. Between the Rocky Mountains and the Pacific Alps, called Sierra Nevada (q. v.) in California and Cascade Range further N., lies a rainless region, mostly S. of 40° N. lat., with an average elevation of 5000 feet above the ocean, great part of it communicating, not with the sea, but draining into salt lakes and marshes. Except where irrigated, this plateau is utterly unproductive. To the N. it is drained by the Columbia, with its tributary the Snake River, which forces its way through the Sierras to the Pacific; while in the southern portion the Colorado and its affluents, after flowing through frightful cañons 3000–5000 feet below the surface of the plateau for some 600 miles, forms a delta at the head of the Gulf of California. The Great Cañon of the Colorado is more than 300 miles long. Between the Sierras and the ocean stretches the comparatively narrow but rich and beautiful sea-coast known as the Pacific Slope, drained by the Columbia, the Klamath, the Sacramento, and the San Joaquin, along with numerous smaller streams. The 'Great Divide,' or watershed, is in Montana and Wyoming Territories, whence flow the Missouri, Columbia, and Colorado. In this wild region the U.S. Congress set apart in February 1872 the 'Yellowstone National Park,' a tract 64 × 55 miles in extent (area, 3575 miles) in the N.W. of Wyoming. The region, while mostly unfit for agriculture and mining, contains more natural marvels than can be found elsewhere. There are hot springs with their basins encrusted with calcareous spar, steam-jets, geysers, mud volcanoes, waterfalls, caves with stalactites and stalagmites, eroded columns, statues, castles, cathedrals, &c., and a large lake swarming with fish. The valley of the Upper Yellowstone (q. v.), abounds in these wonders. At some points it flows through basaltic arches and past seeming ruins. The Column Mountain has numberless monuments and towers, the result of erosion and upheaval. The geysers of Fire Hole basin, on the main fork of the Madison river, surpass those of Iceland, and there are boiling springs, steam-jets, and mud-volcanoes. Colorado, about the 38th and 39th parallels, has many natural wonders; its famous parks, the beds of vast ancient lakes, its coloured rocks, its 'Garden of the Gods,' entered by a gateway of red and yellow sandstone 300 feet high, walled in by sandstone, with its statues, towers, cathedrals, and caves, while Pike's Peak, 14,336 feet high, forms the background.

Seaboard, Islands, and Lakes.—The shore line of the U. S. extends to 12,609 miles—6861 miles on the Atlantic, 3467 on the Gulf of Mexico, and 2281 on the Pacific, but this is indefinitely increased by the navigable lakes and rivers. On the great lakes, Buffalo, Chicago, Cleveland, Detroit, and Milwaukee are important seaports. The Atlantic coast abounds in bays and sheltered inlets, but the Pacific coast is badly provided with harbours. The chief islands of the Atlantic coast are Nantucket, Martha's Vineyard, Long Island, Manhattan and Staten Islands, Roanoke Island, Helena, and the Florida Keys. In the Gulf of Mexico are the Tortugas, St. George's, Santa Rosa, the Chandeleur Islands, Galveston, and Padre Island. On the Pacific coast are the Santa Catalina and Santa Cruz groups, and San Juan. Lakes Superior, Huron, St. Clair, Erie, and Ontario are shared by the U.S. and the Dominion of Canada, but Lake Michigan is wholly within the U.S. Other notable lakes are Moosehead in Maine; Champlain, George, and Oneida in New York; Okeechobee in Florida; Caddo and Portchartrain in Louisiana; Winnebago in Wisconsin: Spirit Lake in Minnesota; Devil's Lake in Dakota; Yellowstone in Wyoming; Utah and Great Salt Lake, in Utah; Pyramid in Nevada; Tulare, Mono, Tahoe, and Clear Lakes in California.

Climate, and Hygienic Conditions.—The vast area of the U.S. necessarily exhibits a great variety of climate. New York has the winter of Copenhagen and the summer of Rome, the minimum range of the mercury being 5° in winter, and the maximum 98° in summer. The states bordering on Canada exceed both of these extremes, but throughout the middle states, lat 37°–41°, the climate is agreeable and often delightful throughout most of the year. The main peculiarity of the N. American seasons is the almost total absence of spring. Mason and Dixon's Line (q. v.), with its westerly extension along the Ohio, Mississippi, and Missouri, has an historical interest, but is also of climatic importance in the geography of the Cis-Missouri states. N. of it, sledges are in frequent use during winter; S. of it, they are seen rarely. To the N. the productions are those of the temperate zone, and the states were always free; to the S., the country, the old home of slavery, becomes more and more tropical as we advance. From meridians 98° to 100° the climate is still variable from year to year, seasons of rain and plenty being followed by others in which drought is the forerunner of scarcity. But the planting of forest trees and the cultivation of the soil, at first by irrigation, has increased the amount of rainfall, and within the next twenty years the region W. of 100° W. long. will yield the greatest crops on record anywhere. In 1869, '70, '71, and '72, in Weld Co., Colorado, between meridians 104° and 105°, 312, 316, 319, and 322 bushels of shelled Indian corn were raised to the acre. Along the Pacific seaboard, especially in California, the climate resembles that of S. Europe. The isothermal lines, roughly stated, show a mean temperature of 72° for Florida, the Gulf Shores, and Arizona; of from 52° to 60° for S. of Pennsylvania, Virginia, the N. border of the Carolinas, Tennessee, Missouri, Kansas, S. of Utah and Nevada, and the greater part of California; from 44° to 52° for Massachusetts, New York, Michigan, Northern Illinois, Nebraska, Oregon and Washington territory; and from 36° to 44° for Maine, parts of New Hampshire and Vermont, Wisconsin, Minnesota, the whole crest of the Rocky Mountains, and parts of Oregon and California along the Sierras. The annual rainfall ranges from 56 to 64 inches in the S. of Florida and along the N.W. Pacific coast; 44 to 56 inches over the New England coast and the greater part of the Southern States, while in New York, Pennsylvania, Illinois, &c., it is 32–44 inches. In Texas, the Indian territory, E. Kansas and Nebraska, Dakota and Minnesota, and W. California, it is 20–32 inches, while in the tract between 98° and 118° it ranges from 18 to 4 inches. In 1860–1870, the death-rate of the whole U.S.

was 1·28 per 100. Malarial diseases prevail in the lowlands of most of the Southern States, as also in the new and marshy portions of the W. States below 40° N. lat. In 1878 an outbreak of yellow fever at Memphis, Vicksburg, and New Orleans carried off 12,000 persons in twelve weeks. Consumption and chest diseases prevail in the New England and in the Middle States. Minnesota, Colorado, California, Arkansas, Georgia, and Florida are favourite resorts for persons with weak lungs. On the whole, the climate of the U.S. may be called healthy, malarious and deadly spots being very few; while certain districts, especially of Florida, the central plains, and the Pacific coast, are among the most salubrious in the world.

Geology and Mineralogy.—Geologically as well as geographically the U. S. are divided into two great sections by the Rocky Mountains, along whose whole extent, in a wide belt from N. to S., Cretaceous formations predominate, with occasional stretches of Carboniferous strata. Tertiary formations embrace almost the whole of the basin between the Rocky Mountains and the Pacific Alps, broken by igneous rocks in Washington territory and Oregon, and Metamorphic strata along the Sierras; in the E. section Tertiary formations stretch along the coast from the Rio Grande almost to the Hudson. Metamorphic, igneous, and Devonian rocks prevail in New England, and along the shores of the great lakes the Middle Devonian or Old Red Sandstone. Older Palæozoic groups occur in Wisconsin, Ohio, and Tennessee, and run side by side with Metamorphic strata along the Appalachians, while a large proportion of the interior is occupied by great Carboniferous deposits. Anthracite coal occurs in New England, and the basins of Pennsylvania embrace about 472 sq. miles, and extend to a depth of from 60 to 100 feet. The Appalachian coal-fields embrace an area of over 59,000 sq. miles, those of Michigan 6700 sq. miles, those of Illinois 36,000 sq. miles, and those of Missouri 84,300 sq. miles. These great beds are said to be twenty times richer than all the coal-fields of Europe put together. The total production of coal in the year 1877 was 52,101,339 tons; Pennsylvania alone in 1877 raised 22,816,359 tons of anthracite coal, and employed 66,842 men in and about the mines. The aggregate yield of petroleum in the year 1870 was 181,263,502 gallons, of which W. Virginia produced 8,000,000, Ohio 2,000,000, and Pennsylvania the rest. In 1878 the production was 607,200,000 gallons, and the export 339,000,000 gallons. The ores of iron abound in the States, and include all known ores. The ore-beds most largely worked are in Connecticut, New York, New Jersey, Pennsylvania, Ohio, Michigan, Tennessee, W. Virginia, Alabama, Georgia, Wisconsin, Minnesota, Dakota, Columbia, Utah, and California. Most of these beds are inexhaustible. The amount of pig-iron produced and marketed in 1870 was 2,066,594 tons, and the quantity could be increased tenfold. Copper ore yielding 90-95 per cent. of pure metal is found in N. Michigan, and ores less rich in Vermont, Connecticut, N. Carolina, Tennessee, Columbia, and California; zinc in New Jersey, Pennsylvania, Arkansas, and California; lead ores (galena) in Minnesota, Iowa, Columbia, Wyoming, Utah, Dakota, Nevada, &c.; tin in California, and a little elsewhere; quicksilver (78,600 flasks in 1877) in California and Nevada. Gold and silver are widely distributed, 14 States and territories reporting them; but California, Nevada, Columbia, Montana, Dakota, Arizona, and Utah produce 29·30 of the whole, and Nevada alone about one-half. Nevada, Columbia, Utah, and Arizona yield more silver than gold. The total bullion production of 1878 was $96,952,421—gold $50,226,107; silver, $46,726,314.

Flora and Fauna.—The indigenous plants of the U. S. are estimated at about 5000 species, California alone producing at least 2500. The potato, the tobacco-plant, and maize, now so familiar in Europe, have all been introduced from the U. S. or Mexico. The U. S. are especially rich in valuable timber-trees, of which no less than 120 species, growing in sufficient quantities to be of commercial importance, attain a height of 100 feet and upwards. Of these 12 species reach an altitude of 200 feet, and 5 or 6 exceed 300 feet. Hickory, magnolia, liquid-amber, sassafras, and sequoia trees (to which species belong the giant trees of California), found only in a fossil state in the Old World, abound in the U. S., as well as palmetto, tulip-tree, cypress, cotton-wood, live-oak, and other oaks, and a number of trees more or less closely resembling the common species of Western Europe, to which the same names have been given. For the zoology of the U. S. see AMERICA, NORTH. So far as they have as yet been described and classified, the Vertebrata are estimated at 2249 species, the Mollusca at about 1434 species, while an eminent entomologist considers that there are probably over 50,000 species of insects.

Agriculture and Live Stock.—The public lands held by the U. S. in 1878 amounted to 1,814,772,648 acres, of which 724,311,477 had been surveyed, and 1,090,461,171 acres were unsurveyed. Of the latter, 379,529,600 were in Alaska. About 8,000,000 acres are sold annually. When surveyed, they are divided into townships, 6 miles square, containing 36 'sections' of 640 acres, which again are divided into half and quarter sections, and offered for sale, generally at $1·25 per acre, one section being reserved in each township for common schools. The average size of farms is 153 acres, and the total extent of area cultivated was 121,300,000 acres in 1878. The cereal crop most largely produced is Indian corn, which is grown in almost all the states, but especially on the plains about the Ohio, Mississippi, and Missouri, and in Texas. In 1878 the number of bushels produced was 1,371,000,000, while wheat, which is mainly cultivated in the Northern and Central States, California, and Oregon, reached 422,000,000 bushels. There were 406,394,000 bushels of oats, 1,371,000,000 of corn, 35,600,000 of barley, 22,100,000 of rye. The Southern States raise large quantities of cereals, especially maize, but the staples of the northern tier (Maine, Kentucky, Maryland, and N. Virginia) are tobacco, maize, and wheat; of the southern tier (N. Carolina, S. Carolina, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas, and Tennessee) cotton and maize, to which S. Carolina, Georgia, and Louisiana add rice, Florida oranges, and Louisiana and Texas sugar. The production of tobacco in 1877 reached 490,000,000 lbs., and the export of cotton from 1st September 1877 to 1st September 1878 amounted to 3,558,560 bales. The number of acres under Indian corn was, in 1877, 50,369,113; under wheat, 26,277,546; under oats, 12,826,148; under other cereals, 3,677,479; under potatoes, 1,792,287; under hay, 25,367,708 (31,629,300 tons); and under tobacco, 387,142. In 1877, 88,250,000 lbs. of rice were produced altogether in the Southern States; of maple sugar 41,000,000 lbs., principally in the Northern States; while of cane and sorghum sugar 229,800 hogsheads, and of molasses 26,347,079 gallons, principally in the Southern States. The Northern States, and especially New York and Vermont, furnish immense quantities of dairy products, and there is now a large export trade in meat (see TEXAS). In 1878, 4,500,000 acres were devoted to fruit culture, and the value of the apple crop was $138,216,700, of pears $14,130, peaches $46,135,000, grapes $2,118,000, strawberries $3,000,000, and other fruits $10,432,000. The preserving and 'canning' of fruit has of late years become an important branch of trade. In 1879 there were in the U. S. 10,618,800 horses, 21,077,100 cattle, 12,206,600 milch cows, 38,482,600 sheep, and 34,331,400 pigs. The total estimated value of farm animals in 1878 was $1,845,584,863.

Industries.—At the census of 1870 there were in the U. S. 252,148 manufacturing establishments, employing 2,053,996 hands, and the capital employed amounted to $2,118,208,769, the wages paid to $775,584,343, and the total produce to $4,232,325,442. There were 956 cotton-mills, 2891 woollen mills, and the production of carpets alone amounted in 1875 to $6,475,200. The production of wool increased from 75,000,000 lbs. in 1861 to 207,000,000 lbs. in 1878, and now constitutes 4·5 of the whole consumption. In 1862 American mills used 130,644,720 pounds; in 1878, 249,149,004 pounds. In 1872 woollen goods valued at $53,408,431 were imported; in 1878, $25,220,154. In 1877-78 American mills consumed 1,554,974 bales of cotton (699,736,247 lbs.), against 3,558,569 bales exported. In 1878 there were 698 blast furnaces, 3403 rolling mills, 4514 single puddling-mills, 11 Bessemer steel works, 22 Bessemer converters, 14 open-hearth steel works, 38 crucible cast-steel works, &c. In the year ending 30th June 1878, 22 iron vessels were built in the ports, with a tonnage of 26,960. In 1877, during which year 446 furnaces were out of blast, the total production of pig-iron was 2,066,594, and in 1878 that of steel-rails was 682,776 tons, of steel ingots 637,342 tons, and of iron rails 332,540 tons. Out of 716 furnaces only 248 were in blast in January 1879. Silk goods are manufactured to the extent of $23,000,000, and $19,000,000 are imported. Besides textiles and hardware, the principal manufactures are bleaching and dyeing, books, bricks, carriages, and cars, clothing, flour and other food products, furniture, glass, hats, hosiery, leather

in all forms, rubber goods, liquors, machinery—agricultural and other; musical instruments, oils of all kinds, paints, paper, wood manufactures, sewing machines, sugar-refining, cigars, &c. The river and coast fisheries are very productive; the canned oyster, lobster, and salmon trade has of late years become exceedingly extensive.

Commerce and Communication.—The commercial marine of the U. S. was greatly diminished during the war, but is now increasing, and in 1878 numbered 25,264 vessels of 4,212,765 tons, and of these 4472 were steamers of 1,167,678 tons. In the year ending 30th June 1878, of the vessels that entered the ports 10,594 of 3,642,417 tons were American, and 20,202 of 10,821,387 tons belonged to other countries; while of those that cleared, 10,872 of 3,872,203 tons were American, and 20,492 of 10,935,328 tons belonged to other countries. Besides these there entered of coasters 74,843 of 34,142,785 tons, and cleared 74,219 of 32,906,672 tons. The total imports and exports for the year ending 30th June 1878 (exclusive of bullion and specie), were $437,051,532—less foreign exports, $14,156,498 = $422,895,034 and $680,709,268 respectively. The imports have declined since 1875, and still more since 1873, when they stood at $624,689,727. The exports, however, were larger in 1878 than in any previous year, and show an increase of $411,319,368, or 153 per cent., since 1868. Agricultural produce is of course the staple material of export. Cereals stand first in the list, and comprise mainly wheat, maize, and rye; they are followed by cotton, tobacco, sugar, provisions, iron and steel, petroleum, leather, and live-stock. Of the articles the export of which has greatly increased during the last decade, the chief are bread and bread-stuffs (value 1878, $181,777,841), provisions ($123,556,323), coal-oil and petroleum ($46,574,974), iron and steel, and manufactures of these ($15,882,508), cotton manufactures ($11,438,660), leather and leather goods ($8,080,030), live-stock ($5,844,653), oil-cake ($5,095,163), and farm implements ($2,575,197). There has been, on the other hand, a striking decrease in the imports of manufactured cottons (decrease since 1873, $16,120,287), of raw wool ($12,070,923), of silks ($10,052,063), of railroad bars ($19,740,172), of iron in pigs ($12,491,232), of cutlery ($6,786,910), tin and tin-plates ($5,090,783), of clocks and watches ($2,462,243), and of tea ($8,806,002). The import of railroad bars actually decreased from $19,740,702 in 1873 to $530 in 1878. The decrease of imports of sugar, syrup, and molasses from 1873 to 1878 is $15,080,335. More than half of the exports ($460,136,521) are absorbed by Great Britain and Ireland (£19,356,796 worth of wheat, flour, and meal alone in 1878), and the British colonies and possessions, and the rest chiefly to France, Germany, Spain and its colonies, China, and S. America. The internal commerce and communication of the U. S. is carried on by means of the great navigable rivers and canals and an elaborate system of railroads. There are 3188 miles of canals, and on the 1st January 1878 there were 79,208 miles of railway open for traffic, while 2688 miles additional were constructed in the course of 1878. There were, in 1878, 37,345 post-offices in the U. S., which transmitted in that year 689,580,670 letters and 170,015,500 post cards, besides other communications. At the same date there were 9500 telegraph offices, with lines 110,000 and wires 242,000 miles long, 21,000,000 messages being transmitted in the course of the year. There is more travelling in the U. S. than in any other country, and in no country is travelling made so comfortable. The river steamboats are provided with a luxurious saloon almost as long and wide as the vessel itself; the railway carriages, furnished with every necessary, communicate with each other like a suite of rooms. In the new States the country roads are bad; in swampy places logs are laid across to form 'corduroy' roads over which vehicles jolt at the slowest rate. The hotels and boarding-houses, the largest and most perfect in the world, are chosen as permanent residences by many families, as well as temporary homes by the hundreds of thousands of guests from all parts of the world. There is some difficulty with servants, but perhaps not more than in Great Britain.

Ethnology.—For the aboriginal races see INDIANS, AMERICAN, and separate articles on the principal tribes. Statistics of the foreign elements in the population of the U. S. are given above. How the fusion of these heterogeneous, and in some cases mutually antagonistic, masses into one national whole is to accomplish itself, is one of the most interesting points of speculation in connection with the future of America. Until the beginning of the present century the white population was, with the single exception of New York, where the Dutch element prevailed, almost exclusively of British descent, but since then it has received large and varied accessions. The negro population is mostly confined to the Southern and Middle States. Germans are distributed over all the Northern States, but especially in and around New York, along the S. shore of Lake Erie and in the North-Western States, around St. Louis, and in parts of Ohio, Indiana, Illinois, and Iowa. The Irish population is densest in New York, S. New England, New Jersey, and E. Pennsylvania, but is also diffused through the whole Northern States. English immigrants are very numerous in New England, New York, New Jersey, and Pennsylvania, and to some extent along the lake shores. The Welsh seek the mining and dairy districts. British Americans are most numerous in New England and the North tier of States; and by far the greater proportion of the Scandinavian settlements are W. of Lake Michigan. A further admixture of race has resulted from annexation; the French came in with Louisiana, and Spanish and Mexican with the admission of Florida, Texas, New Mexico, and California. The Chinese and Japanese are most numerous on the Pacific Coast, but some are found in the States E. of the Rocky Mountains. Their whole number is not probably over 150,000. English, which is gradually absorbing all other languages, is used in the State legislatures, schools, and courts of law, but some of the newspapers are published in German, French, and Scandinavian, in the districts most densely occupied by these nationalities. For an account of the linguistic peculiarities resulting from natural associations and the fusion of diverse tongues, see the article AMERICANISMS.

Religion and Education.—The Constitution expressly forbids any state support to religion, which it leaves entirely free. The consequence of this perfect freedom has been a voluntaryism in religion which has certainly produced excellent results in the Republic. The religious denominations are divided into groups, which, though comprising several distinct bodies, will probably eventually come together. The Methodist group is numerically the largest, embracing in its various organisations in 1878 about 3,400,000 members, and an adherent population of about 13 millions; the Baptist group comes next, and includes about 3,000,000 members and 12,500,000 adherents. The Mennonites, who are migrating from Russia in such numbers, belong to this group. The Presbyterian group, with 1,250,000 members and 6,000,000 adherents, comes next, and the Roman Catholics follow with an adherent population of 5,700,000. Next to these are the Lutherans, largely Germans or Scandinavians. They have 650,000 members and 3,000,000 adherents. The Congregationalists and the Protestant Episcopal Church are nearly equal in numbers, having 420,000 and 400,000 respectively, and adherent populations of about 1,800,000 and 1,700,000. The other denominations are much smaller. The School system in the U. S. is not perfect, but it affords the means of universal elementary instruction. In 1876 the school population was 14,222,991; of these, 8,363,738 were enrolled in the public schools, and 550,000 more in private schools; 4,066,848 were reputed in daily attendance; 249,281 teachers instructed them (96,161 males and 136,542 females); the public school income exceeded $88,000,000, and the annual expenditure $84,000,000. The Permanent Public School funds were $98,754,870. The same year there were 151 normal schools, with 33,921 pupil-teachers; 137 commercial and business colleges, with 25,000 students; 130 Kindergartens, with 4090 pupils; 1559 schools for secondary instruction, with 142,872 students of both sexes; 356 universities and colleges, with 56,481 students; 343 professional and scientific schools, with 24,697 students; 133 schools for deaf mutes, blind, idiots, &c., with 20,000 pupils; and 385 orphan asylums, with 47,439 inmates. The universities and colleges best known are Harvard (q. v.), Yale (q. v.), Princeton (q. v.), Columbia (q. v.), Amherst (q. v.), Cornell (q. v.), University of Michigan, La Fayette (q. v.), Brown (q. v.), Williams (q. v.), Bowdoin, Vassar (q. v.), Wells, Wellesley, and Smith, the last four being for women only. There were, in 1876, 3723 public libraries in the U. S., containing 12,376,473 volumes and 2,500,000 pamphlets. The periodical press is the most prolific in the world (see NEWSPAPERS), and public lectures are delivered everywhere.

Army and Navy.—The enormous military establishments necessitated by the Civil War have been gradually reduced to

very small limits. Whereas in May 1865 the U. S. forces, including the volunteer and regular army, amounted to 1,000,000 men, it is now provided that there shall not at any time be more than 25,000 enlisted men in the service. In 1878 the U. S. army had a total strength of 27,161, including 2161 officers. These are distributed in 5 regiments of artillery, 10 of cavalry, and 25 of infantry, besides a corps of engineers. The higher officers are a general, a lieutenant-general, 3 major-generals, 14 brigadier-generals, 67 colonels, 86 lieutenant-colonels, and 242 majors. The President is, *ex officio*, commander-in-chief of the army, and of the State militia, which comprises (1878) 8101 officers and 145,219 men, and which can be put on a war footing of 3,434,058. The period of enlistment in the regular army is five years, and all citizens, with certain exceptions, are liable to service in the militia between the ages of eighteen and forty-five. There is a military academy at West Point, where the number of cadets in 1875 was 312. The navy consisted in 1878 of 23 ironclads, for the most part monitors, along with 2 or 3 torpedo ships, 68 steamers not ironclad, and 22 sailing vessels; total number of cannons, 1108. The total force was 7500 strong. There are 10 naval yards, the largest being at Portsmouth, Charleston near Boston, Brooklyn, and Philadelphia. The naval academy (in 1878, 312 midshipmen) is situated at Annapolis.

Constitution, Government, and Finance.—In its own local affairs each State has paramount authority, and is governed according to a Constitution of its own. These constitutions are all constructed upon one model, but differ in details, such as the method of electing the Governor, who is sometimes chosen by the people, sometimes by the legislature. By the constitution of 1787 the powers of the state federal are vested in three institutions, distinct and independent of each other,—namely (1) the presidency, representing the executive; (2) Congress, entrusted with the legislative power; and (3) the Supreme Court, head of the judicature. The Central Government controls the imposition and collection of taxes and duties; the coinage of money; the management of the army and navy; all dealings with foreign powers, &c. The Congress is composed of two Houses, the upper called the Senate, the lower the House of Representatives. To the Upper House each state, whatever its size, sends two senators, chosen by the State Legislature for a term of six years. The members of the House of Representatives are chosen usually by Congressional districts for a term of 2 years, the ratio being fixed after each national census, and each State sending according to its population. The present ratio is 142,000, and the number of members 293. There is also a delegate from each territory, but he has no vote. The President, who holds office for four years, is chosen indirectly—*i.e.*, with the intervention of an electoral college, consisting of electors from each state equal in number to the Senators and Representatives of that state put together. These electors are chosen in most cases by the citizens of the state, in a few by the State Legislature. A Vice-President, who presides in the Senate, and succeeds to the Presidency if the President dies during his term of office, is elected on the same ballot. The President possesses a veto on all measures passed in Congress, but a measure sent back and again passed by a majority of two-thirds in each House is carried over his veto. The Supreme Court consists of a chief justice appointed by the President for life, and eight associate justices. It has the right of deciding in all cases in which the enactments of Congress clash with those of the individual states. There are also 65 district courts, and 9 circuits in which circuit courts are held by the several justices of the supreme court. The executive departments are seven in number:—the department of State, of the Treasury, of War, of the Navy, of the Interior, of Justice, and of the Post-Office. The revenue of the U.S. is raised almost entirely from customs duties and indirect taxes on property, manufactures, &c. Direct taxes are seldom resorted to, owing to a constitutional provision that such taxes shall only be laid on the states in proportion to their population; so that a high rate of taxation would ruin the poorer states, while a low rate would produce a very inadequate result from the richer states. The budget revenue for the financial year 1878–79 is estimated at $269,250,000, viz., from customs $133,000,000, from internal revenue $120,000,000, and the sale of public lands $1,000,000. The expenditure for 1877–78 amounted to $236,964,000, $16,551,323 going to the civil list, $35,397,164 to public works, &c., $27,147,019 to pensions, $32,154,148 to the War Department, $17,365,301 to the Navy, $102,500,875 to the interest on the public debt, including the 'Pacific Railroad Bonds,' and the remainder to foreign intercourse, Indian affairs, &c. The revenue for 1877–78 was $257,446,776. Ever since the year 1865 the revenue of the U.S. has largely exceeded the expenditure, and the income tax has been abolished and other taxes reduced. The aggregate sum expended on custom-houses, post-offices, mints, and hospital buildings in the period 1789-1860 was $28,640,170, and in 1861–76 $41,269,746. The public debt in the year 1790 amounted to $75,463,476; at the conclusion of the English war in 1816 it had risen to $127,334,934; in 1835 it had all been paid off. Before the Mexican war, in 1844, it was again $26,143,996; in 1849 it stood at $64,704,693; in 1860 at $64,769,703; in 1861 at $90,867,828; in 1862 it had risen to $524,176,412; and as the Civil War proceeded it advanced with gigantic strides, until in 1866 it stood at $2,773,236,174. Since then it has steadily decreased to $2,028,648,111 at January 1, 1879. The State debts of all the States and Territories were, on 1st January 1877, $345,197,000. The paper dollar or 'greenback,' which was made a legal tender for all purposes except customs' duties and the payment of interest and principal of the public debt, has fluctuated greatly in value since 1862, being at one time (in 1864) worth only 1s. 6d. in gold, but it has gradually appreciated in value till, with the rapid funding of the debt at 4 per cent., there was a resumption of specie payments, January 1, 1879, and the greenbacks at once advanced to par with gold (4s.). By some unwise legislation in February 1878 it was attempted to make the silver dollar of 412½ grains (900 fine) pass for 100 cents; but the rapid depreciation of silver has rendered this impracticable, and the Bland Silver Act is destined to be speedily repealed.

For statistical information see F. A. Walker's elaborate *Ninth U. S. Census* (3 vols. Wash. 1872, &c.), and his *Statistical Atlas of the U. S.* (Wash. 1874); also the *Quarterly* and *Annual Reports of the Bureau of Statistics*; *First Century of the American Republic* (New York 1876); Vernon's *American Railroad Manual* (New York and Philad. 1877); F. Ratzell's *Vereinigten Staaten* (1st vol. Mun. 1878). On the Constitution see Andrew's *Manual of the Constitution of the U.S.* (New York 1874); Paschal's *Constitution of the U.S.* (Wash. 1868); Seaman's *American System of Government* (New York 1871); Gillet's *Federal Government* (New York 1871); De Tocqueville's *Democracy in America* (new ed. Lond. 1875), and T. D. Woolsey's *Political Science* (2 vols. Lond. 1878).

History.—Passing over the undoubted discovery of New England by Norsemen in the 10th c. as fruitful of no historical results, the first European people in modern times to effect settlements within the present area of the U. S. were the Spaniards, but the honour of laying the broad foundations of the American colonies belongs to England. The settlement of Virginia, properly so called, began in 1607, the colonists being almost exclusively English, and for the most part needy and worthless adventurers. Subsequently, large numbers of debtors and criminals were sent thither, as well as some of a better class. Henry Hudson, an English sailor in command of a Dutch expedition, in 1609 explored the regions about the great river which now bears his name, and the New Netherlands, as they were then called, were settled by the Dutch in 1613. In 1620 the Pilgrim Fathers, who under the guidance of John Robinson (q. v.) had fled from Lincolnshire to Leyden twelve years before, landed at Plymouth and commenced the settlement of New England. The first body of colonists landed at Massachusetts Bay in 1630, was, for the most part, composed of Puritans of higher social position than the Pilgrims of Plymouth. The intolerance of the Massachusetts colony (not the Plymouth) drove Roger Williams and others to found Rhode Island in 1636, as a refuge for persons 'distressed for conscience,' and thither Baptists, Quakers, and other sects resorted. In 1634 Cecil Calvert, Lord Baltimore, organised the colony of Maryland, offering religious toleration to men of all creeds. The settlement of Connecticut and New Haven, both offshoots from Massachusetts, took place in 1634 and 1638. New Hampshire and Maine, though first settled in 1623, were reorganised, the latter as a proprietory colony, in 1641 and 1635. The Carolinas were granted to the Duke of Albemarle and others in 1662. The early colonists were sons of English Cavaliers, Puritans, Irish Presbyterians, Scotch Highlanders, and in S. Carolina many Huguenots. In the next year the New Nether-

lands were conquered by the English, who changed the name of the province to New York. New Jersey, which had already been thinly peopled by Swedish immigrants, was in 1665 and the following years settled by English Quakers, New England Puritans, and Scotch Presbyterians. Pennsylvania was founded in 1681 by William Penn, and was settled mainly by Quakers, Germans from the Palatinate, Huguenots, and Irish Presbyterians. Delaware, an offshoot of Pennsylvania, separated from the mother colony in 1703; and in 1733 Georgia was founded by General Oglethorpe as a refuge for English debtors, orphans, and friendless youths. Some Scotch Highlanders and followers of Whitfield were also among the early settlers. Sketches of the early history of all these colonies will be found in the separate articles devoted to them.

Thus from the very beginning the U. S. were peopled by immigrants of the most widely different races and creeds. Every shade of the opinions, religious and political, which in the 17th c. led Britain into civil war and revolution upon revolution, was represented in full force among the British-born settlers. Almost every other European nation had also contributed its quota to the motley population, and it is said that in the New Netherlands alone, before the English Conquest, eighteen different languages were spoken. The history of each colony, almost from its formation, resolves itself into a record of Indian wars, minor disputes with the other colonies, and, above all, disputes with the authorities in England as to constitution, government, and taxation. In every colony a form of government, more or less resembling that of England in miniature, had either been established of set purpose, or had gradually grown up; yet there were great differences in the spirit with which the different populations regarded their internal institutions, and their relations to the mother country. In the southern colonies the Church of England was established, and the mass of the people belonged to it, while aristocratic and monarchical sentiments, fostered by influences of birth, location, climate, and possibly slavery, co-existed with a strong practical attachment to political freedom. In the northern colonies, independency was the rule in religion, autonomy in politics. The struggles between Massachusetts and the mother country on the subject of the appointment of governors, their salaries, and the afterwards so fatal question of the right of taxation, had been fierce and rancorous, and had even threatened to lead to open rebellion, while the more southern settlements had invariably maintained an attitude of loyalty, whatever firmness they may have shown in claiming and maintaining what they believed to be their rights. From the time of James I. downwards, the policy of the home government had been one of interference and attempted oppression. The navigation laws and the prohibition of manufactures in America were of comparatively small moment, as the former were systematically evaded; and as for the latter, the colonists had neither desire nor opportunity to compete with the mother country in manufactures. The attempts to restrict the right of representation, and to secure for the Crown the nomination of colonial governors, were more serious grievances. In the majority of the colonies the Crown actually succeeded in obtaining this right, and sent out men of low character and small ability, who made themselves and the home government unpopular in the colonies, and brought the colonies into disrepute at home by their unjust and prejudicial reports, from which the English authorities gained almost their whole knowledge of American affairs. The claim of the home government to tax the colonies, though it was among the earliest subjects of dispute, remained an entirely subordinate point of difference, until the wealth of the American possessions had increased so much as to excite the cupidity of English statesmen, when it suddenly assumed the front place among the causes of discord, and resulted in the Revolution and the Declaration of Independence.

Two hostile foreign nations held positions on the frontiers of the colonies. Florida was under Spanish rule, Louisiana and Canada were in the hands of France. Between 1736 and 1742 the colonists of Georgia and S. Carolina were engaged in several petty wars with the Spaniards. A few years later the French formed a design of connecting Canada and Louisiana by a chain of forts along the Ohio and the Mississippi, thus closing in the western frontier of the colonies. During the ten years between 1753 and 1763 a desultory war was carried on, the chief events of which were Braddock's defeat at the Monongahela in 1755, and Wolfe's capture of Quebec in 1759. In this war the colonies had borne more than their share both of danger and expense, and had actually gone considerably into debt; yet scarcely was it concluded when the British Government began to hatch schemes for eking out the imperial revenue by imposts upon the already impoverished dependencies. With Grenville and Townshend rests the responsibility of originating this suicidal policy, with George III. that of supporting and confirming them in their unconstitutional course. It is impossible here to follow the details of the quarrel. Grenville gave notice of the Stamp Act in March 1764; it was passed a year later, and repealed a year later again, the concession being at the same time nullified by an Act asserting explicitly the general right of Parliament to tax the colonies. The Act imposing duties on tea and other imports was passed in May 1767, and was met by a resolution on the part of the colonists to abstain from the use of such imported articles. In 1770 all the duties were remitted except that on tea, which brought into the Treasury the sum of £300 per annum. Concessions in detail, however, had by this time lost their power of throwing dust in the eyes of the Americans; they saw that they were, in effect, mere re-assertions of the unjust and unconstitutional principle. *Non agitur de vectigalibus, libertas in dubio est* was now their belief; and in December 16, 1773, the cargoes of three tea-ships were emptied into Boston harbour. In punishment of this and other acts of insubordination, an Act was passed closing the port of Boston, and inflicting other pains and penalties on the rebellious citizens. The remaining colonies rose like one man to express in word and deed their sympathy with Massachusetts. An inter-colonial congress met at Philadelphia, September 5, 1774, arming and drilling of provincial levies was actively carried on, and it became clear that there was no prospect of obtaining the submission of the colonies without an appeal to force. To us the condition of the popular mind of England, as represented by its servile Parliament and its short-sighted ministers, seems almost incredible. Townshend spoke of the colonists as 'these American children, planted by our care, nourished by our indulgence, and protected by our arms.' In vain Barré replied in the House of Commons:—'They planted by *your* care! No; your oppressions planted them in America. They nourished by *your* indulgence! They grew up by your neglect of them. They protected by *your* arms! They have nobly taken up arms in your defence.' Conway and Shelburne, Burke and Chatham, asserted in vain the impolicy and injustice of the Government's course. They persisted in it blindly, and made of a handful of disunited dependencies a great and united independent empire.

The first blow was struck at Lexington and Concord Bridge on the 19th of April 1775, when it is said that the British troops on their retreat to Boston lost over 300 men. This was followed by the blockade of the troops in Boston and the battle of Bunker Hill (June 17th), in which the British gained a victory, though with a loss nearly double that of the Americans. As early as May the Congress, sitting at Philadelphia, had appointed George Washington, who had already distinguished himself both by courage and conduct in the French war, commander-in-chief of the Continental forces. Ticonderoga and Crown Point, important posts between New England and Canada, were taken by the Americans, but an attack upon Quebec by Montgomery and Arnold in the winter of 1775-76 failed completely. In Virginia the British Governor, Lord Dunmore, emancipated the slaves and armed them against their masters, but effected little beyond the destruction of Norfolk, the richest town in the colony. It had by this time become evident to the British Government that the colonists were no despicable opponents. Foreign mercenaries were enlisted to crush them, Indian tribes were armed against them, and means were resorted to which would have brought discredit upon the British cause, even had it been in itself just. Still through the winter of 1775-76 the colonies hesitated formally to throw off their allegiance to Britain. In the spring of 1776, however, the Navigation Laws were formally repudiated by the Congress opening the ports of America to all nations. One after another the colonies declared themselves independent States, and the united Declaration of Independence of the thirteen colonies, drawn up by Adams, Franklin, Jefferson, and two others, was signed on the 4th of July 1776. 'We must all hang together,' said Franklin, 'unless we would all hang separately.'

On the 16th of March 1776 the British evacuated Boston, and Washington took possession of it; but the following July, a force

sent out under Lord Howe defeated the Americans under Putnam at Brooklyn, took New York, and forced Washington to retire on Philadelphia. New Jersey and Pennsylvania now became the main scene of operations. In engagement after engagement Washington was defeated, almost the only exception being the brilliant skirmish of Trenton, December 26, 1776. On September 11, 1777, Washington was defeated at Brandywine (q. v.), a fortnight later Lord Cornwallis (q. v.) occupied Philadelphia, and on October 4 the Americans suffered another defeat at Germantown (q. v.). The British, however, found it easier to conquer than to subdue. Victory on victory did nothing to advance their cause, and the Continental levies were gradually becoming more and more skilled in the art of war. Foreign officers, of whom Lafayette (q. v.) and Steuben (q. v.) were the most notable, were disciplining and training them, and they were earning the respect of foreign Powers by their dogged resistance. Moreover, their hopes were kept up by successes in other quarters. A British attack on S. Carolina in the spring of 1777 was entirely defeated, and General Burgoyne (q. v.), attempting to march from Canada down the Hudson to join Clinton in New York, was forced to surrender with his whole force at Saratoga (q. v.), October 16, 1777. Early in the next year an alliance was concluded with France; and though a second British attack on S. Carolina was more successful than the first, the apparent advantage was counterbalanced by the evacuation of Philadelphia. During 1778 the British successes in the South continued, but were barren of result, and the treachery of Benedict Arnold was of no advantage to the British, while it led to the execution as a spy of the gallant André (q. v.). The next year (1781) saw the final blow to the British power in America. Cornwallis, attempting to join Clinton in New York from the South, as Burgoyne had attempted from the North, was surrounded at Yorktown (q. v.), and forced to surrender with his whole army on October 19. This virtually ended the war, though peace was not signed till September 3, 1783, and the British troops did not evacuate New York until November 25 of the same year.

Their independence established and recognised, the next care of the States was to provide themselves with a Constitution and a settled form of government. A Convention assembled at Philadelphia in 1787 for this purpose, and drew up the Constitution which has been sketched above. The great difficulty was to adjust the balance of power between the Central Government and the Governments of the various States; and the Constitution as it stands is the result of a compromise between the two parties which had already developed themselves in American politics. (See REPUBLICAN.) Hamilton (q. v.) and Madison (q. v.) were the leaders on the Federal side, and Jefferson (q. v.) and Patrick Henry (q. v.), who, however, were not members of the Convention, on the side of the Democrats. In 1789 Washington became the first President of the U. S., and held the office during two terms. Vermont was admitted as a State in 1791, Kentucky in 1792, Tennessee in 1796, the last year of Washington's Presidency, and Ohio in 1802. John Adams (q. v.) succeeded Washington as President in 1797, and Thomas Jefferson held the Presidency for two terms (1801–1809). Madison who succeeded him (1809–17) had by this time gone over to the party of the Democrats, who sided with France and opposed Great Britain in the European struggle then at its height. A dispute as to the right of British commanders to search American vessels for deserters led to a war with Britain which lasted from 1812 to 1815, and was principally notable for its stirring sea-fights, the capture of Washington and Baltimore by the British (1814), and the defence of New Orleans (1814–15), in which General Andrew Jackson (q. v.) first came prominently to the front. An enormous acquisition of territory had been made in 1803 by the purchase from France of the province of Louisiana, then held to include an indefinite stretch of country W. of the Mississippi. In 1812 the State of Louisiana was admitted to the Union, and was followed by Indiana (1816), Mississippi (1817), Illinois (1818), Alabama (1819), Maine (1820), and Missouri (1821). In 1820 Spain ceded Florida to the U.S. Madison was succeeded in 1817 by James Monroe (q. v.), now principally remembered by his famous 'doctrine' of 'America for the Americans,' who, after two terms, gave place to John Quincy Adams (q. v.) in 1825. The fiftieth anniversary of independence was celebrated on the 4th July 1826, on which day, by a strange and striking coincidence, Thomas Jefferson and John Adams, authors of the Declaration of Independence, both died. The next Presidents were Andrew Jackson (1829–37), Martin Van Buren (1837–41), W. H. Harrison, who died after holding office barely a month, and was succeeded by the Vice-President John Tyler (1841–45), James Polk (1845–49), and Zachary Taylor, who died after fifteen months of office, and was succeeded by Vice-President Millard Fillmore (1849–53). During Jackson's presidency the chief political question was that of free-trade against protection. The South supported free-trade, the North protection, and on the passing of a high protective tariff, S. Carolina, a State always inclined to insubordination, threatened to take refuge in 'Nullification,' or the alleged right of a State to repudiate the measures of the central government. The dispute was settled by a compromise brought about by the new 'Whig' party, at whose head were Henry Clay (q. v.) and Daniel Webster (q. v.). Tyler's presidency was marked by serious difficulties with Great Britain, which were, however, peaceably concluded by the Ashburton treaty, which settled definitely the boundaries of the British possessions.

From an early period it had been apparent that slavery must be the test question in the political differences between the North and South. The climate and form of agriculture in the South were favourable to slave labour, while in the North they were unfavourable. By a natural reaction, slavery affected the habits and modes of life and thought of the white population of the South. Their prejudices and their interests alike differed from those of the Northerners. Not that there was at first any such passionate attachment to the principle of slavery as was afterwards fostered by circumstances; on the contrary, such men as Washington and Jefferson, themselves slave-owners, looked forward to the gradual abolition of a system whose evils they recognised, and their views were very widely shared in the South. In 1808 the importation of slaves was made illegal; so late as 1832 the Virginian Assembly discussed the question of abolishing slavery in the State; and, in fact, it was very generally held to be an evil, necessary for the present, but which should be allowed to die out as soon as possible. On the other hand, the Northern opposition to slavery was not organised till 1833, and cast no votes till 1840. As the territory of the U. S. extended, however, and as new States were admitted to the Union, the question became one of overwhelming political importance. If slavery were permitted in the new States, they would naturally throw in their lot with the South; if not, they would side with the North. As a large proportion of the new States and territories were fitted by nature for slave labour, the South demanded that the question of its permission should be left to the State itself, and thus the old question of State rights as opposed to central authority became doubly important. On the admission of Missouri in 1821 an arrangement was arrived at—known as the 'Missouri Compromise'—by which it was provided that slavery should be prohibited N. of 36° 30′ N. latitude, and permitted S. of that line. Arkansas and Florida, admitted in 1836 and 1845 respectively, were S. of this line; Michigan, admitted in 1837, was N. of it. In 1837 Texas, which had recently thrown off the Mexican yoke, claimed admission to the Union. A long struggle followed. The North, unwilling to incur a war with Mexico, and equally unwilling to add to the number and power of the slave States, opposed the claim, while the South favoured it. The latter ultimately carried the day. In 1846 Texas was admitted to the Union; and in 1847 General Taylor defeated Santa Anna at Buena Vista, and General Scott, landing at Vera Cruz with 12,000 men, invaded the heart of the Republic and took the city of Mexico. Iowa and Wisconsin were admitted as States in 1846 and 1848 respectively. By the Treaty of Guadalupe, Hidalgo (2d Feb. 1848), New Mexico, and California became territories of the U. S.; and the great Californian gold discoveries following almost immediately, a vast rush of emigration ensued, so that by 1850 California was ready for admission to the Union. California had in 1849 adopted a constitution prohibiting slavery, and the South was loud in its demands not only for the rejection of California, but for an amendment to the Constitution against the further proscription of slavery. The fierce struggle which ensued was terminated by Henry Clay's Compromise Act, which admitted California as a free State, and prohibited the slave-trade in the Federal District, but made large concessions to Texas, and enacted a law for the rendition of fugitive slaves. This settlement only increased the public agitation. Franklin Pierce was elected President in 1852 by the South and the

Northern Democracy, and in 1854 Stephen A. Douglas of Illinois proposed the 'Kansas and Nebraska Bill,' in which he announced his doctrine of 'Squatter Sovereignty,' leaving to the territorial inhabitants to decide by vote whether they would have slavery or not, and repealing the 'Missouri Compromise.' This bill was passed, and a great struggle ensued between the North and South as to the introduction of slavery into Kansas. After much bloodshed and anarchy it was admitted as a free State in 1861. In 1857 Pierce was succeeded by James Buchanan; Oregon and Minnesota were admitted as States; and a decision in the Supreme Court laid down as law that negroes though free could not be citizens of the Union, that Congress had no power to forbid slavery in any State or territory, and that slaves, if bought in a slave State, could be removed to a free State, and still remain slaves. This decision, known as the Dred Scott decision, strengthened the desire of the North for radical reform in the constitution with regard to slavery, and matters came rapidly to a crisis. In 1859, John Brown, a New York Abolitionist, who had attempted, against the Fugitive Slave law, to run off slaves from Virginia, was captured, tried, and hanged by order of a Virginian court at Harper's Ferry, Virginia, and immediately was regarded as an anti-slavery martyr. The next presidential election (November 1860) was a test-struggle, and when, owing to the division of parties, four candidates were in the field, and Abraham Lincoln (q. v.), Republican, was elected, South Carolina seceded from the Union in December 1860.

President Buchanan, who served for four months after Mr. Lincoln's election was known, might possibly have arrested the Secession movement had he acted promptly and vigorously, but he lacked nerve in the great emergency, and the disruption went on. In February 1861 a Confederacy was formed, consisting of South Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, and Florida. Jefferson Davis (q. v.) was chosen President, and Alexander H. Stephens (q. v.) Vice-President. Virginia, North Carolina, Tennessee, and Arkansas soon joined the Confederacy, and active preparations for war were made on both sides. We cannot here attempt to follow in detail the operations of a war which raged for four years, and spread over an enormous extent of territory. From the first the policy of the South was mainly defensive, the inroads made by its troops into Northern territory being, with few exceptions, only feints. The object of the North, on the other hand, being to bring back the seceding States to obedience to the Constitution and fealty to the Union, the Federals naturally became the invading and aggressive party. The main points, or rather lines of attack, were two. The Federal and Confederate capitals, Washington and Richmond, looked each other in the face at a comparatively short distance, and thus the valley of the Potomac and Northern Virginia became one great battle-ground. Here Lee (q. v.), perhaps the most astute general the war produced, was pitted against M'Clellan, Pope, Burnside, Hooker, Meade, and ultimately Grant, fighting with varied fortune, but with a courage, skill, and determination, under the most adverse circumstances, which cannot be sufficiently admired. Though seconded early in the war by that remarkable strategist, 'Stonewall' Jackson (q. v.), and after his death by Ewell, Stuart, and Longstreet, Lee himself deserves the principal credit of the series of campaigns in which for three years forces overwhelmingly superior to his in numbers, arms, and supplies were completely held in check. The Mississippi formed the other line of attack. Down its course Halleck, Grant (q. v.), Sherman (q. v.), Rosecrans, and Thomas, fought their way, sometimes checked (for Johnson, the Confederate commander, was an able general), but generally victorious, and pressing steadily on, aided by the naval forces which blockaded the ports and destroyed the Confederate war-steamers and iron-clads, at last had the Southern and South-Western States entirely at their mercy. The North had the advantage from the first in men, money, and supplies, and in the fact that southern territory was the battle-ground. These circumstances had their weight, but the Federal generals and armies were not lacking in military skill, courage, or persistency, and the result would probably not have been different had the parties been more equally matched. The proclamation of emancipation issued by President Lincoln, January 1, 1863, aided the Federal cause; and when, a year later, General Grant was appointed lieutenant-general and commander-in-chief, measures were adopted which, with vast expenditure of money and life, brought the war to a close. The two armies East and West acted in harmony; Grant directed the operations on the Potomac and James in person, and Sherman made a brilliant succession of marches, from Chattanooga to Atlanta, from Atlanta to the sea at Savannah, and thence northward to N. Carolina to join Grant. Richmond fell April 3, 1865, General Lee surrendered April 9, and the war was practically ended, April 14, 1865. President Lincoln, who had just entered upon his second term, was assassinated, and the whole nation was in mourning. The Vice-President, Andrew Johnson, succeeded him, and soon came into collision with Congress in regard to the reconstruction of the seceded States, and his impeachment was attempted, but unsuccessfully. The Presidential election of 1868 resulted in a Republican victory, Seymour the Democratic candidate being defeated by General Grant, who held office for two terms, and was succeeded in 1877 by Rutherford B. Hayes, also a Republican. Four new States have been admitted since the outbreak of the war—West Virginia (1863), Nevada and Nebraska (1864), and Colorado (1876). In 1869 the Pacific railroad from Omaha on the Missouri to San Francisco was completed; other transcontinental roads are now in progress. The claims made by the U. S. Government for damages done during the war by the *Alabama* and other Confederate cruisers built and equipped in British dockyards, at one time threatened to lead to war between the two nations, but were peacefully settled by the Geneva arbitration (1872), which awarded to the U. S. a gross sum of $15,500,000. There have been several small Indian wars of late years in Arizona, Montana, and elsewhere, and the U. S. have suffered one terrible disaster in the total annihilation of five companies of cavalry commanded by General Custer, in an attack upon a tribe of Sioux under the leadership of 'Sitting Bull' (1876). A great International Exhibition at Philadelphia celebrated the centenary of American Independence in 1876. There were strikes, and in a few instances riots, among railway employés on the Great Trunk Railway in August 1877, but these were soon suppressed, and the worthless 'tramps,' who were the principal rioters, arrested and punished. Socialism and communism were feared from the large immigration of European Communists in 1877 and 1878; but a free country is the last place where anarchists can make any headway, and all their efforts have proved abortive. In 1878 an International Commission gave an award of £1,100,000 against the U.S. on account of the losses from the fisheries in the maritime provinces of the Dominion of Canada. The history of the U.S. during the next twenty years cannot fail to be as interesting, though it may not be so painfully exciting, as that of the past two decades. See Bancroft's *History of the U. S.* (new ed. 6 vols. Lond. 1876), Doyle's *American Colonies Previous to the Declaration of Independence* (Lond. 1869), and the same author's *History of America* (Lond. 1874), Cassell's *History of the U. S.* by E. Ollier (Lond. 1874–77), W. Cullen Bryant and S. H. Gay's *Popular History of the U. S.* (New York, vols. i. and ii. 1876–79).

Literature.—A great deal of ingenuity has been expended in explaining why the U. S. do not and can not excel in literature and art as they excel in invention and industry. The inquiry is a somewhat futile one, since, so far as literature at least is concerned, the fact sought to be explained does not exist. The U. S. have during the present century contributed more than their fair share to the literature of the English language. Nor is it the case, as is often alleged, that their best writers never get beyond the more or less successful imitation of European models. Their literature is now original and national in the highest and best sense. So early as 1638, Harvard College was founded at Cambridge, Massachusetts. In Virginia, where up to the Revolution there had been, as one of the governors had boasted, neither a school nor a printing-press, William-and-Mary College was founded in 1690. Yale College, in Connecticut, was founded in 1701, and three years later the first American newspaper, the *Boston News Letter*, was started. During the 17th c. there were several now forgotten theological writers among the New England Puritans. Increase and Cotton Mather (q. v.) are, however, still remembered, the latter with a notoriety not altogether literary. William Bradford (1588–1657), the second Governor of Plymouth, wrote a history of that colony and an account of New England in verse; and Anne Bradstreet (1612–72), wife of a Governor of Massachusetts, published a volume of poems in 1640 which were reprinted in London, 1650, under the title of *The Tenth Muse*

lately sprung up in America. William Hubbard (1621-1704) wrote a history of the Indian wars in New England, as well as a general history of the colony. The greatest of pre-revolutionary writers was undoubtedly Jonathan Edwards (q. v.). Contemporary with him was William Stith (1689-1755), who wrote a history of Virginia, which unfortunately did not extend beyond the earliest period of the colony. Logan (1674-1751), Rittenhouse (1732-96), and Godfrey distinguished themselves in natural science, and Bertram (1699-1777) was a botanist of eminence. The awakening of national life at the Revolution was naturally accompanied by a revival of letters. Madison (q. v.) and Hamilton (q. v.), by their essays under the title of *The Federalist*, greatly advanced the cause of the Constitution, and in political history the writings of Jefferson (q. v.), Patrick Henry (q. v.), and the Adamses (q. v.) will always be of value. Both in politics and science Franklin (q. v.) takes a leading place. Poetry of more or less merit was written by Dwight (q. v.), Barlow (q. v.), Trumbull (1750-1831), Hopkinson (1738-1791), Humphreys (1753-1818), Mrs. Warren (1728-1815), and Brackenridge (1748-1816), who wrote a drama on the Battle of Bunker Hill. *Yankee Doodle* was written by a certain Dr. Sheckburg about the middle of the 18th c., and *Hail Columbia* by Francis Hopkinson in 1798. After the Revolution came a period of imitation of English models, in which Irving (q. v.) and Cooper (q. v.), justly called the American Goldsmith and Scott, are the leading figures. C. B. Brown (q. v.), Washington Allston (q. v.), R. H. Dana (d. February 1879), Fitzgreene Halleck (q. v.), John Pierpont (1785-1866), James Kirke Paulding (1799-1860), John Pendleton Kennedy (1795-1870), James Hall (1793-1868), Charles Sprague (b. 1791), and James Gates Percival (1795-1856), also deserve mention among the imaginative writers of this period. The next generation was, or rather is, of different and stronger stuff. Foremost among them in point of time as well as in literary significance stands Ralph Waldo Emerson (q. v.), one of the most original thinkers of our century, cosmopolitan in a sense, yet at heart intensely American. Equally original, though in a different fashion, was the genius of Nathaniel Hawthorne (q. v.), whose subtle and sombre imagination is unique in the history of literature. Edgar Allan Poe (q. v.) was a poet and essayist whose excellences have only of late been fully appreciated. William Cullen Bryant (q. v.), as poet, essayist, and publicist, occupies a high rank, blending classic dignity with a deep sympathy for American life and scenery, while Henry Wadsworth Longfellow (q. v.), the most popular of American poets, has drawn much of his inspiration from the history, characteristics, and scenery of the New World, though his cultured fancy finds an equal charm in the distant splendours of medieval Europe. James Russell Lowell (q. v.), wittiest of critics and poets, first attracted attention by a humorous dialect poem on certain phases of American politics. John Greenleaf Whittier (q. v.) is characterised by earnest enthusiasm, intense sympathy for humanity, and ardent love of nature; while Oliver Wendell Holmes (q. v.), who, in poetry, is the most graceful writer of *vers de société* in America, unites in his prose works deep scientific and literary insight with the most genial and charming humour. Among other imaginative writers and critics the following deserve mention:—N. P. Willis (1807-67), C. P. Cranch (b. 1813), Bayard Taylor (q. v.), J. G. Holland (b. 1819), R. H. Stoddard (b. 1825), Richard Grant White (b. 1822), E. P. Whipple (b. 1819), J. T. Fields (b. 1817), and among the younger generation E. C. Stedman (b. 1833), T. B. Aldrich (b. 1836), W. D. Howells (b. 1837), and Henry James, jr., Hjalmar H. Böjesen, and Joaquin Miller (b. 1841), whose rank among poets is still undetermined, but whose verse is redolent of the Far West, and who seems ambitious to be regarded as the 'Byron of the prairies.' Walt Whitman (q. v.)., 'the poet of democracy,' is a literary phenomenon, not as yet appreciated except by a select few of the initiated on both sides of the Atlantic. H. D. Thoreau (q. v.) will probably be remembered rather as the friend of Emerson than as what he was—a curious combination of the poet and the naturalist. Another friend of Emerson, William Ellery Channing (q. v.), heads the list of American theologians, which can also show such names as that of Charles Hodge (1797-1878), Mark Hopkins (b. 1802), Gardiner Spring (1785-1873), Wm. Staughton (1770-1829), and Alex. Campbell (1786-1866). Of popular preachers the most notable are H. W. Beecher (q. v.), R. S. Stons (b. 1821), R. D. Hitchcock (b. 1817), and T. de Witt Talmage (b. 1832). R. D. Owen (q. v.) deserves mention for his writings on social philosophy. Mrs. Harriet Beecher Stowe (see BEECHER), author of *Uncle Tom's Cabin*, &c., Mrs. Hale, Mrs. Osgood, Mrs. Sigourney (q. v.), Miss Sedgwick, Mrs. C. M. Childs, Mrs. Parton ('Fanny Fern,' 1811-72), C. E. Beecher (1800-1878), Mrs. Terhune ('Marion Harland,' b. 1835), E. Stuart Phelps (1815-52), Susan and Anna Warner (1818 and 1820), Mrs. A. D. Whitney (b. 1824), M. A. Dodge ('Gail Hamilton'), Louisa M. Alcott, Mrs. F. H. Burnett, &c., are among the most noted authoresses. American historians are not inferior to American poets. Washington Irving did some graceful if not profound historical work; George Bancroft (q. v.) has made the history of his own country his study, William Hickling Prescott (q. v.) devoted himself to Spain and the Spanish conquests, and John Lothrop Motley (q. v.) to Holland and Germany, while George Ticknor (q. v.) gave us the best history of Spanish literature in any language. The last four of these, by their talent and original research, take a place in the first rank of historical authors. Noah Webster (q. v.) and Joseph Emerson Worcester (1784-1865) are among the best known of English lexicographers, and W. D. Whitney (b. 1827) is known throughout Europe as one of the most distinguished of philologists. We now come to the latest and perhaps the most characteristic development of American literature, commonly known as 'American humour.' The germ of the peculiar humoristic manner, which distinguishes American comic writers, is to be found in several American classics. It appears in Irving, it is very prominent in Lowell and Holmes, and is even traceable in Emerson. Charles F. Browne (q. v.), or 'Artemus Ward,' was the first of the humorists properly so called. He set the fashion of misspelling, which has done a great deal to hide the true merits of American humour, but he was in his way a writer of genuine comic invention and originality. By far the greatest of the humorists, however, are Francis Bret Harte (q. v.) and Samuel L. Clemmens or 'Mark Twain.' The former possesses much real (as well as much unreal) pathos, along with brilliant wit and keen power of observation, and is a true 'humorist' in the sense in which Thackeray used the term. The latter, with an unrivalled fertility of comic invention, possesses a power of graphic description which raises him far above the mass of comic writers. Charles G. Leland (q. v.) is distinguished by genuine scholarship along with humorous power; Henry W. Shaw, or 'Josh Billings' (b. 1818), conceals trenchant wit and keen observation beneath a foolish mask of affected bad spelling. R. H. Newell, or 'Orpheus C. Kerr' (b. 1836), Seba Smith, or 'Major Jack Downing' (1792-1868), Max Adeler, J. P. Bailey, or 'the Danbury Newsman,' 'Dod Grile,' and John Habberton, also deserve mention. American humorists suffer in the estimation of the English cultured public, partly by reason of a certain superficial vulgarity which they almost all share, and partly on account of the cheap and catch-penny form in which their works are issued by English publishers. See M. C. Tyler, *History of American Literature*, 1607-1765 (2 vols. Lond. 1879), and Duyckinck's *Cyclopædia of American Literature* (2 vols. new ed. Philad. 1878).

Uni'ted States of Colom'bia. See COLOMBIA, UNITED STATES OF.

U'nities. The law of the *Three U.* of *Place*, *Time*, and *Action*, which ruled supreme in the classical period of the French drama, demanded that there should be no shifting of the scene from place to place, that the whole series of events should be such as might occur within the space of a single day, and that nothing should be admitted irrelevant to the development of the single plot. The introduction of the law was due to Richelieu, who, being pleased by Mairet's *Sophonisbe*, in which the U. were observed, secured their formal enactment by the Abbé d'Aubignac in his *Pratique du Théâtre*. The restrictions were accepted by Corneille, Racine, and Voltaire, and in short continued in force till the rise of the Romantic school; though Corneille himself, in his essay on the subject, admitted that the unity of place at least had no support from Aristotle or Horace, whose authority had been claimed by D'Aubignac. For a time the validity and value of the law were matters of keen debate.

U'nivalves, the name applied to those shells which consist of a single piece. Thus the shell of a snail, whelk, or corory is a univalve. The term is used in opposition to *bivalve*, applied to the oysters, cockles, clams, and other *Lamellibranchiate*

(q. v.) shells, and also to *multivalve*, in which more than two pieces are developed.

Univer'salists are those who believe in the ultimate salvation of all men and created spirits; negatively they direct their criticism against an eternal hell, in some cases even against any suffering after death. Their arguments may be thus briefly summed up :—1. The word (*aionios*) translated 'everlasting' or 'eternal' properly describes the 'age' or 'duration' of the noun to which it is attached, and derives its extension of meaning from the noun. Thus 'eternal' life may be everlasting, because it is in and from God, but 'eternal' death is not necessarily everlasting, because the *æon* ('cycle of duration') of the latter is not necessarily co-extensive in duration with the *æon* of the former. 2. The general character and teaching of Christ is inconsistent with the doctrine of eternal punishment. 3. The view is also inconsistent with a just conception of Deity, as it either (*a*) limits his power to save, or (*b*) denies his desire. 4. It is impossible for the most wicked man to do anything during his life sufficient to deserve so awful a retribution; besides, if the opposite view be taken in its extreme character (as represented with the startling abruptness of documents like the Confession of Faith), only a very small portion of the human race are saved. All the rest, however good they may be humanly speaking, are condemned to unspeakable and unceasing anguish. But this is to confess the failure of and really to caricature Christianity. To these arguments it has been replied—1. Generally, the arguments for eternal punishment must not be discredited because the case has been put in a false light by certain advocates of this doctrine. Few would now maintain that the future punishment of the wicked is physical, or would extend the limits of the 'wicked' so widely as to include Socrates and Plato. 2. We are obliged to infer some form of eternal retribution; (*a*) from a loyal adherence to the words of Scripture, which, on a fair and natural construction, seem really to teach this doctrine; (*b*) from a general conviction of the wickedness of sin and the necessary infinite consequences of a transgression, which, though committed in time, has yet endless results. Moreover, there is nothing unreasonable or unjust in the conception of this world as a period of probation, and this is what the orthodox view really asserts. Origen (185–283) may be taken as the founder of the theory of Universalism. He held 'that the resurrection nature of mankind will not include material bodies; that the punishment of the wicked and of evil spirits will not be eternal, and that all intelligent beings tend towards re-absorption into the One fountain of Being from which they sprang.' Origen is, however, only one of many great Patristic names that could be quoted in support of the doctrine, though previous to the Reformation it never acquired much force, as the indefinite limits of purgatory softened the extreme harshness of the two opposing alternatives. In post-Reformation times there were again many individuals who leaned towards this belief, but the extreme harshness of the theological disputations of the period prevented the growth or even the existence of the doctrine as that of a sect. About 1750, James Kelly, a Unitarian clergyman, founded the English sect of U., which up to the present day has maintained a languishing existence. John Murray, once an English Methodist, emigrated to America about 1770, and established the doctrine of the U. there. The sect grew and prospered, and had in 1862 1000 congregations, 8 academies, and 3 colleges. It would not be just, however, to hold an enumeration like that just given a fair measure of the influence of the U. Their distinctive doctrine is openly held in some form or other by an increasing number of members of all the churches. A belief in Universalism is no bar to office in the Church of England—perhaps not even in the Scottish Church. Like many other heresies, its influence is not to be measured by the number of its professed adherents, but by its general influence on the whole Christian Church. See Whittimore's *History of Universalism* (Boston 1860); Williamson's *Exposition and Defence of Universalism* (New York 1840). *Cf.* also G. Macdonald's eloquent *Unspoken Sermons* (Lond. 1866), and the work kindred in thought, Canon Farrar's *Eternal Hope* (*ib.* 1878).

Univer'sities, though offering analogies to Greek and Roman schools, trace their historic continuity no further than the 12th, or, at the most, 8th c. A.D. Their germs must be sought in the Karoling schools of France, the Palatine, and Italy, and the Saracen schools of Bagdad and Cordova, in such distinctively professional institutes as Salerno's of medicine, Bologna's of Roman law, and in the Paris lecture-rooms of the early schoolmen, Abelard, Roscelin, and William of Champeaux. One science attracts another, and so fresh faculties were added to arts, to medicine, or to law; teaching begets instructors, and these received their stamp of fitness in Degrees (q. v.). Through gradual development from within, aided by charters of kings and popes from without, schools grew into U.,—corporations, that is, of teachers and scholars (*universitates doctorum et scholarium*), though later interpreted 'places of universal study' (*studii universitates*). Such growth has been fully traced in two typical cases, PARIS and OXFORD; each seat of learning has been specially described; so here need be only handled the spread, the general aim, and present state of U. Their type, first struck at Bologna (*cir.* 1158), Paris (1200), Oxford (12th c.), and Cambridge (1229), was reproduced by members of foreign 'Nations' returning home, as when in 1348 the Paris student Karl IV. founded at Prague the earliest university within his empire; or by emigrant students, as when in 1638 the colonists of Cambridge, Massachusetts, erected Harvard on the lines of the Old-World Cambridge. Again, St. Andrews (1413) owed its establishment to wars that cut off the studious Scottish youth from their Moray College at Paris, and the Reformation, opening religious, as wars political, breaches, called into existence new Protestant U. Theoretically at least, the aim of every university is the same—instruction of youth in liberal culture, primarily to develop school-gained knowledge into science, secondarily to promote its practical application. As knowledge widens, teachers themselves must follow up new paths of study, where English Fellowships (q. v.) were meant for their *viaticum*; for as careers are always multiplying, the students' claims on the professors multiply. A perfect university were that at which teachers could teach and all learners who would could learn everything. An impossible ideal this, but let us see how near the various U. approach, how far fall short of it. No country has so many and so well-attended U. as Germany, as shown by the following table for 1878, where the date of foundation is given and the division into the four faculties, of which philosophy embraces the humanities, mathematics, and natural science :—

UNIVERSITIES.	INSTRUCTORS.	STUDENTS.				
		Theology.	Jurisprudence.	Philosophy.	Medicine.	Total.
Berlin (1810)	214	168	1158	1163	345	2834
Bonn (1818)	103	139	219	357	126	841
Breslau (1702)	106	101	432	557	168	1253
Erlangen (1743)	61	133	51	98	166	448
Freiburg (1457)	55	41	78	70	147	336
Giessen (1607)	59	20	89	117	89	315
Göttingen (1734)	124	86	275	433	115	909
Greifswald (1456)	56	43	76	126	218	463
Halle (1694)	103	189	112	447	106	854
Heidelberg (1386)	113	19	183	180	79	461
Jena (1558)	77	61	116	219	73	469
Kiel (1665)	62	51	20	89	82	242
Königsberg (1544)	87	42	174	305	134	655
Leipzig (1409)	155	339	1103	1133	451	3026
Marburg (1527)	70	51	85	179	100	415
Munich (1826)	123	82	392	409	477	1360
Münster (1631)	29	107		196		303
Rostock (1419)	40	29	28	52	36	145
Strassburg (1872)	94	49	156	275	150	630
Tübingen (1477)	87	409	256	135	146	946
Würzburg (1582)	69	135	94	214	498	941
Total	1887	2294	5097	6749	3706	17,846

The average annual expenses of the ten Prussian U. amount to £370,000, of which the State defrays about two-thirds; on Leipzig the Saxon Government bestowed £37,744 in 1877, internal revenues supplying the rest, £17,304. These are small sums compared with the result attained—the conferring, namely, of university training on 1 per 2400 of the entire German population. The possibility of the high standard of this education depends as elsewhere on the state of the schools, and from school every student must bring a *maturitätszeugniss*, answering to our B.A. degree. This falls outside the university sphere, as also does the *staatsprüfung*, or Government examination, which all candidates for the church, the bar, or medical profession have to pass; so that during his university career a student is left to cultivate knowledge for knowledge' sake. For *the* degree, of

doctor, he has to produce a thesis on some self-chosen subject of research—one reason this of Germany's grand advancement of science; the other being its system of *privat-docenten*, or assistants of the professorate, who, with the professional standard before their eyes, keep the professors themselves up to the mark. Non-residence, cheap living, and the *verbindungen* (student-brotherhoods), supplying partly the place of a college system, but unfortunately associated with foolish duels, are among the most striking features of German U., which, starting with strong Renaissance and Reformation impulses, stiffened awhile into torpid orthodoxy, but thence were roused by the Napoleonic wars. Austria has nine U.—Vienna (1365; with 246 instructors and 3975 students in 1878*), Prague (1348; 129 and 1592), Pesth (1777; 127 and 1979), Gratz (1827; 94 and 731), Innsbruck (1672; 66 and 600), Cracow (1401; 67 and 400), Lemberg (1817), Czernowitz (1875; 38 and 192), and Agram (1877). Vienna and Prague rank high as medical schools; all generally resemble the German U., but like the English they put great faith in multiplied examinations, a system an English scholar has likened to plucking up a plant by the roots to observe its growth. Also on the German model are the U. of Switzerland, Basel (1460), Zürich (1833), Bern (1834), and Geneva (1875), with an aggregate of 1149 students (among them some 90 women); of the Netherlands, Leyden (1575), Gröningen (1614), Utrecht (1636), and Amsterdam (1877), with 1800 students; of Belgium, Ghent (1816), Liège (1816), Louvain (1834), and Brussels (1837), with 2566 students; and of Scandinavia, Copenhagen (1479; 1200 students), Christiania (1813; 978 students in 1874), Upsala (1417), and Lund (1668), with 2080 students in 1871.

In Italy the seventeen State U.—Bologna (1158), Padua (1222), Pavia (1361), Turin (1404), &c.—in 1875 had 949 professors and 6553 students, not reckoning Naples (1224), where any native of the province may attend. Untouched by the Renaissance, these U., the latest stronghold of Averroism, have fallen from their high medieval estate, the students of to-day neglecting letters for such 'bread-studies' as law and medicine. Signor Bonghi's Act of 1875, assimilating them to the German system, was mainly rescinded in the following year, when the examining functions were restored to the various faculties. France is at present in a transition state. To replace the U. of Paris and twenty-two other towns, which the Revolution had swept away, a system of higher instruction was founded in 1808, by which every department has its academy and faculties, constituting, with a central examining and degree-granting body at Paris (resembling the London University), the University of France. In 1872 there were in all 421 instructors and 14,572 students in the five faculties of theology, law, medicine, mathematics and natural science, and literature (philosophy, history, and philology). This system has been materially modified by the clerical victory of 1875, by which corporations, associations, &c., are suffered to found free U., and whose fruits are the six new Catholic U. of Paris, Lille, Angers, Lyon, Poitiers, and Toulouse, with Jesuits (numbering 1461 in 1879) for instructors. The Government, unable to withdraw the consent once given, has since been occupied with a scheme for from five to six State U. established on the German pattern, but the plan remains hitherto on paper. Enough has been said under SPAIN and RUSSIA of their U., so we may pass to the English U. of Oxford and Cambridge, both independent corporations, free from the support and control of State, both immensely wealthy. Apart from university revenues, the Oxford colleges in 1874 had a yearly external income of £307,369, the Cambridge of £264,256. At the former university the professors numbered (1878) 48, the undergraduates 2659; at the latter there were 37 professors and 2485 undergraduates. Most of the Anglican clergy and many barristers study at the English U., but theology and law rarely form part of their studies; in 1877, 225 members of Parliament were university men, but only 250 of the 14,101 medical practitioners of England and Wales had graduated at Oxford, Cambridge, or Durham. Always to have held general culture as their main end, never to have degenerated into mere technical schools, are Oxford and Cambridge's proudest boasts; and Oxford, an Oxford professor testifies, 'has handed its traditional knowledge down, laid up in a napkin.' Both U. have lately recognised a sense of shortcomings in numberless reforms, such as the founding of twenty-four new chairs since 1847, the recognising by Cambridge of Local Lectures (1873), and the establishment of systems of Unattached Students (q. v.), while at Cambridge we find the Cavendish College (1876), 'designed for those who must commence the active work of life earlier than ordinary undergraduates,' and a proposed Selwyn Missionary College; at Oxford, Keble College (q. v.), a Military College, and a proposed Indian Institute. At present, however, the work of technical training is mainly thrown on such purely professional institutions as theological colleges, medical schools, and the Inns of Court; the University of London (q. v.) is merely an examining body, that of Durham (q. v.) only a miniature Oxford; and the surest hope of converting university training from an exclusive luxury into a national boon still lies in the proposed erection of Owens College (q. v.) and similar establishments into U., whose professorate might well be supplied by Oxford and Cambridge. The Scottish U., St. Andrews (1412), Glasgow (1454), Aberdeen (1506), and Edinburgh (1582), revert to the Continental type, the students being non-resident, their studies directly feeding the three learned professions, the teaching body consisting of professors and their assistants. Living is cheap, and the literary session falls in the five winter months, so that with the aid of Bursaries (q. v.) a lower social class enjoys the benefits of the U. than in any other European country. On the other hand, there is no entrance-examination, and the consequent mixture of forward and backward students renders a high standard of scholarship impossible, while by the Education Act of 1872 one of the best sources of trained material (the village 'dominie') has been swept away. In 1878 Aberdeen had 31 professors and assistants, and 625 students; St. Andrews 14, and 159; Glasgow 31, and 2018 (1243 arts, 60 divinity, 492 medicine, and 223 law); and Edinburgh, whose total income (1877) was only £26,783, 78 and 2545 (945 arts, 67 divinity, 1070 medicine, and 363 law). With these figures may be compared the 48 professors and 1110 students of the University of Dublin (q. v.) in 1879, with its revenues (1873) of £61,324; and the 52 professors and 886 students of the Queen's Colleges (q. v.), whose income (1878) was £33,504 (parliamentary grant £12,504). In 1875 there were no fewer than 545 degree-giving institutions within the United States (q. v.), but most of them, being inadequately endowed, furnish very secondary instruction; a very large proportion represent some sectarian opinion; and some 'have little more than a name, a charter, and a bias.' At the Revolution only nine colleges existed, Harvard (1638), William and Mary (1693), Yale (1701), &c.; to these before 1800 seventeen were added; the rest are of modern growth. Harvard and Yale, however, remain the only true U. in the European sense of the term, since they alone include theology, law, and medicine; the John Hopkins University, opened at Baltimore on the German plan in 1876, being not yet fully organised, and the scheme for establishing a national university at Washington being still (1879) a scheme. In 1876 Harvard had 128 instructors and 1263 students; Yale, 87 instructors, besides special lecturers, and 1021 students. See works cited under PARIS and OXFORD, and Stohr's *Deutsches Akademisches Jahrbuch* (vol. iv. Leip. 1879), whose issue for 1877 contains a full bibliography; also vol. i. of Raumer's *Geschichte der Pädagogik* (4th ed. Gütersl. 1872; Eng. trans. New York 1859), Zarncke's *Deutsche Universitäten im Mittelalter* (Leip. 1857), Sybel's *Deutsche Universitäten* (2d ed. Bonn 1874), Meyer's *Deutsche Universitatsentwickelung* (Berl. 1875), Budinszky's *Universität Paris im Mittelalter* (Berl. 1876), Cardinal Newman's *Historical Sketches of U.* (Lond. 1872) and *Idea of a University* (3d ed. Lond. 1873), and Brock's *American U.* (Cinc. 1875).

* All succeeding statistics, unless it be otherwise specified, refer to 1878.

Univer'sities Tests Act (1871) provides that no one shall be required on taking any degree, except a degree in divinity, from the universities of Oxford, Cambridge, or Durham, to subscribe any article or formulary of faith, or to conform to any religious observance or form of public worship; and the privileges of graduates are to be exercised also independently of doctrinal tests; but no office of the Church of England is open by this Act to any one who is not a member of the Church of England.

Univer'sity Coll'ege, Ox'ford, according to the now generally abandoned tradition, was founded by King Ælfred in 872, but its historic existence dates from the bequest (1249) of William of Durham, rector of Wearmouth, for the maintenance of certain 'masters.' The present foundation consists of a master, twelve fellows (one of them in Civil Law), and eighteen

scholars. The latter receive £80 for five years, and there are further about six exhibitions tenable for eighteen terms. U. C. presents to ten livings, and in 1878 had 113 undergraduates, 235 members of Convocation, and 446 members on the books.

Univer'sity of France. See UNIVERSITIES.

Unkiar'-Skeless'i, a small town of Turkey in Asia, in the neighbourhood of Scutari, gives its name to a treaty concluded July 8, 1833, between Turkey and Russia, by a secret article of which the Sultan undertook to close the Dardanelles against foreign ships of war, thereby permitting the Russians to land in force at Scutari. This treaty was subsequently annulled by that concluded at London, July 13, 1841. See TURKEY.

Unleav'ened Bread was that which, according to the injunctions of the Jewish law, was alone to be used in all offerings made by fire to the Lord (Lev. ii. 4, 11, vii. 12, viii. 2); and there can be little doubt that the shewbread was the same, although it is not expressly stated (*cf.* Jos. *Ant.* iii. 6, 6). Only U. B. was to be eaten by the people also during the seven days of the Passover (Ex. xii.). The reason for these ordinances is not difficult to see. Leaven is simply dough kept till it becomes sour or begins to putrefy, and the process of fermentation which it produces is one of corruption, which would naturally be excluded from all sacred bread.

Unn'a, a town in Westfalen, Prussia, 13¾ miles E. of Dortmund by rail. It has a Protestant and a Catholic church. There are iron foundries, tanneries, weaving-mills, breweries, tobacco manufactories, and the great salt-works and baths of Königsborn. Pop. (1875) 7330. U. belonged to the Hanseatic League.

Unst (formerly *Onyst* or *Ornyst*, Scand. 'eagle's nest'), the most northerly of the Shetland Islands (q. v.), has a length of 11 and a maximum breadth of 6 miles. Area, 35 sq. miles; pop. (1871) 2768. It presents the rocky outline and bleak surface common to the group. Chromate of iron is exported. Fishing and agriculture employ the inhabitants.

Unt'erwalden, one of the three Waldstätten or original cantons of Switzerland, bounded N. by Schwyz and Lucerne, W. by Lucerne, S. by Bern, and E. by Uri. Area, 295 sq. miles; pop. (1876) 27,002. It consists mainly of two great parallel valleys running N. and S. and terminating in the shores at the Lake of Lucerne, each about 15 miles in length, the eastern drained by the Engelberg Aa, and the western by the Sarner Aa. Offsets from the St. Gothard group enclose it on three sides, and separate the basin of the Aar from that of the Reuss, while spurs of the Bernese Alps cover the south, rising in Titlis to 10,427 and in Rothstock to 9620 feet. It is entirely a pastoral country. It exports cattle, hides, honey, and fruits, but chiefly cheese and butter of the finest quality. By the Kernwald the canton is divided into two districts which have been politically distinct since 1150, and which are considered as half cantons, each sending one member to the Ständerath or State Council. They are distinguished, in relation to the Kernwald, as *Nidwalden* and *Obwalden*. The former is made up of the Engelberg valley and the district around the Lake of Lucerne, and has an area of 112 sq. miles, and a pop. (1876) of 11,933; the latter includes the valley of the Sarner Aa and the upper part of the Engelberg valley, and has an area of 183 sq. miles, and a pop. (1876) of 15,009. The government of both divisions is based upon the purest democracy, all legislative power resting in the Landesgemeinde or open-air assembly of all male citizens of full age. The present constitution of Obwalden was adopted by the Landesgemeinde, October 27, 1865; that of the Nid-walden, April 2, 1877.

Unyanyem'bé, a town in Central Africa, capital of a district of the same name, forming part of the country of Unyamuesi. The town of U. is an important settlement of Arab traders, for whose protection a garrison was maintained till lately by the Seyyid of Zanzibar. The houses are substantial, and the Arabs cultivate wheat, onions, and fruit-trees imported from the coast, which is 400 miles distant. The climate is very deadly to Europeans. Pop. 5000. The name U., according to Cameron, signifies 'country of the hoes,' *i.e.*, cultivated country.

Unyo'ro, a kingdom of Central Africa, included between Lake Albert Nyanza, the Victoria Nile, and the kingdom of Uganda (q. v.). The southern and eastern portions are nearly a dead flat, covered with long grass and thick forests of small trees; but the northern and western districts possess a rolling surface and a park-like vegetation. The promontory of Usongara, on the Albert Nyanza, contains a vast salt-field, whence the surrounding lands are supplied. Cattle constitute the chief wealth of the natives, and ivory, which is very plentiful, is the principal trade medium. The climate is moist, and extremely unhealthy for Europeans. The capital, Mrooli, is situated at the junction of the Kafur River with the Victoria Nile, and is a large place, chiefly remarkable for the extreme filthiness of its streets and dwellings, the king's palace being no exception to the rule. See the works of Speke, Baker, and Stanley.

Upan'ishad (=that which underlies the surface), the third and latest portion of the Vedas (q. v.) or primitive revelation of the Hindus. It contains the mystical doctrine of philosophical monotheism, upon which the later systems of metaphysics were based, as opposed to the hymns and ritualistic precepts of the two other parts of the Vedas. About 150 Upanishads are enumerated, of which the most important is called the *Isa*. They are written in prose, with occasional variations in verse. The oldest may reach back to the 6th c. B.C. They are the only portion of the Vedas studied at the present day by orthodox Hindus, as well as by the reformed Theists or Brahmo Somaj. See Muir's *Original Sanskrit Texts* and Prof. Monier Williams' *Indian Wisdom*.

U'pas (Malay, 'poison'), a celebrated tree of Java—the 'Antigar' of the natives of that island, the 'pohon U.' of the Malays, and the *Antiaris toxicaria* of botanists—belonging to the natural order *Artocarpaceæ* (q. v.) or bread-fruit family. After the 16th c. the most exaggerated reports concerning this tree began to reach Europe—that no animal life could exist within range of its effluvia—that no other vegetation was possible within miles of where it grew—that waters in its neighbourhood were untenanted, &c. The naturalists Blume, Horsfield, and Leschenault destroyed the mystery and romance. According to Dr. Horsfield it is one of the largest forest-trees of Java, its white-barked trunk rising to a height of 70 feet before branching. The leaves are lanceolate, the flowers bisexual, the fruits a drupe covered with fleshy scales. On puncturing the bark a yellowish juice exudes, which becomes brown on the surface by exposure. This juice is highly poisonous, and is the principal ingredient of the arrow-poison used by the natives, producing death in fifteen to thirty minutes after introduction into the system. It is said to render the heart insensible to the stimulus of the blood. The flesh of animals killed by it may be eaten with impunity. The inner bark of young trees is made into garments after being carefully cleansed from all the juice. *Antiaris innoxia* of India furnishes ready-made sacks for holding rice. In the Moluccas, another and more terrible poison than the U. above mentioned is obtained from the bark of the root of *Strychnos Tieute*, and is called U. Radja ('the Emperor's poison'). It acts like *Nux vomica*, but in a more intense and violent manner: a tiger struck by an arrow poisoned with it falls in less than a minute.

Uphea'val, the raising of the surface formations by the action of internal forces. U. may be sudden, as in volcanic disturbances, or slow and gradual; as, for instance, the elevation of the coast-line, which may be traced in the raised beaches on our own shores.

Uphol'stery, a branch of industry concerned with the furnishing of houses with beds, curtains and other hangings, carpets, &c.

Upolu,' the principal island of the Samoan Group (q. v.) in the S. Pacific, has a circumference of about 140 miles, and a pop. of about 16,000 A belt of low land skirts the coast, and is succeeded by a table-land which rises inland into successive mountain-ridges, clothed to their summits with the richest verdure. Cotton, cocoa-nut oil, and copra are the chief items of its growing export trade, which is carried on principally with Hamburg. Apia, the capital of the group, is on the N. side of U. It has a fine harbour and many good houses.

Up'sala, a town of Sweden, in the *län* of the same name, 41 miles N.N.W. of Stockholm by rail. It is cut in two by the Fyris or U. River, which, 5 miles below, falls into Ekoln, a bay of Lake Mälar. The chief buildings of U. are the Cathedral (1287-1441), the largest in Sweden, in the interior 360 feet long by 106 to 140 feet broad, with the tombs of Erik the Saint, Gustaf I., Johan III., Linné, and others; the Palace, founded 1548 by Gustaf I., rebuilt after the fire of 1702; the archbishop's

residence; 'Carolina Rediviva,' with a library of 200,000 vols.; the 'Gustavianum,' with lecture-halls and museums; the buildings of the Botanic Institute, the Observatory, the new hospital, and the Cathedral school. After the removal about 1270 of the archiepiscopal see from *Gamla* ('old') *Upsala* (3½ miles N.) to *Oestra Aros*, the latter gradually grew into the modern U., which in the Middle Ages was famous as a place of pilgrimage. It had then four churches, two chapels, two monasteries (one Franciscan, the other of the Holy Spirit), and a priests' college, which in 1477 was chartered as a 'high school.' The Reformation in Sweden was determined by the celebrated 'U. Conference' in 1593, where was also sanctioned the 'High School,' which gradually developed into a University. In April 1878 it had 110 teachers and 1370 students. U. has a 'Latin School,' a lyceum, and a school-teachers' college. Pop. (1876) 13,049.

Uræ'mia. See URINE, DISEASES OF.

U'ral (*Jaik*), a river of Russia, forming part of the boundary between Europe and Asia, rises in one of the highest ravines of the Kalgantau in the South U. Mountains, flows first S. to Orsk, then W. to Uralsk, when it turns to the S. and enters the Caspian Sea by many mouths, after a course of 870 miles. It is scarcely navigated at all, less from its shallowness than from the barrenness and paucity of population of the district through which it flows. The fisheries, however, are extensive. Its principal affluent from the right is the Sakmara (250 miles), and from the left the Ilek (308 miles).

U'ral Mountains (Tartar 'belt,' Lat. *Montes Riphaei*), the longest chain of mountains running N. and S. in the Old World, extending for 1970 miles from the deep basin of the Caspian and Aral Seas, in 48° N. lat., to the coast of the Northern Ocean, and across the Kara Strait into Novaia Zemlia, terminating at 76½° N. lat. They divide themselves into three sections—(1) The Northern Urals, from the Northern Ocean to the source of the Petchora, consisting of wild and rocky mountains, mostly without vegetation, rising in the highest point, Mount Syrty, to 4157 feet. Though only 50 miles in breadth, several parallel chains are formed separated by long valleys crossed transversely by depressions which form easy passes for the transport of the produce of Siberia to Archangel. (2) The Middle Urals, extending S. to the source of the Ufa, a broad table-land rather than a mountain-chain, of moderate height, sloping gradually W. and E. The highest points are Nurtchum (5315 feet), Kirtim (4265 feet), and Kumba (3330 feet). The road from Perm to Jekaterinburg is the principal pass. The mineral wealth of the Middle Urals is great, and consists of gold, silver, copper, platinum, iron, and coal. This district yields one-third of the whole iron produce of Russia. (3) The Southern Urals extending S. in three divisions, the most western of which stretches along the right bank of the Ural river. Its highest points are Iremel (5039 feet), Taganai (3440 feet), and Vurma (3448 feet). See Murchison, *Geology of Russia in Europe and the U. M.* (new ed. Lond. 1853); and Hochstetter, *Ueber den U.* (Berl. 1873).

Uralsk', a Russian town in the district of the Ural Cossacks, on the right bank of the Ural, 150 miles E.S.E. of Samara. It is the seat of a Hetman, has four churches, an important horse and cattle market, valuable fisheries, and a large trade in caviare and tallow. Pop. (1870) 4957.

Ura'nia (Gr. *Ourania*, 'the heavenly one') is the name given in Greek mythology to the Muse of Astronomy. She is called the daughter of Zeus by Mnemosyne, and the mother of Linus and Hymenæus. On medals, &c., she is represented with a celestial globe in her hand, to which she points with a small staff. U. is also the name of a nymph, and a surname of Aphrodite.

Ura'nium (U = 240), a metallic element discovered by Klaproth in 1789, occurs in various minerals, such as pitchblende, uranite, chalcolite, &c. The metal may be obtained either as a black coherent powder or in fused white globules. It has a strong affinity for chlorine and sulphur, forming with the former two compounds, the *uranous chloride* ($U\,Cl_4$) and *uranic oxychloride* ($UO_2\,Cl_2$). The corresponding oxides ($Cl\,O_2$ and $Cl\,O_3$) are bases, and act upon acids to form salts. Uranic oxide also acts as an acid with respect to the more basic metallic oxides, forming a series of compounds known as the *uranites*. These compounds are yellow, and insoluble in water. Sodium uranate ($Na_2\,O\,2UO_3$) is used as a yellow pigment in the glazing of porcelain, and also for colouring glass. Uranic oxide is used for the same purpose, and is the colouring matter of the well-known fluorescent U. glass. The uranous salts are distinguished by their green colour.

U'ranus, the seventh planet in order of distance from the sun, and the outermost but one of all the known members of the planetary system. It was discovered on March 13, 1781, by Sir W. Herschel, who supposed it to be a comet. The calculations of its elements, however, soon proved it to be a planet; and it was then found that it had been observed and recorded as a fixed star no less than fifteen times by Flamsteed, Bradley, Lemonnière, and Mayer. Herschel named it *Georgium Sidus* in honour of George III.; but it was known on the Continent as *Herschel* until the present name was suggested and adopted. The mean distance of U. from the sun is about 1,754,000,000 miles; the eccentricity of the orbit is ·046578; and the length of the year 30686·82 days, or about 84 of our years. The inclination of the orbit to the ecliptic is very small, only 46½ minutes. The equatorial diameter of the planet is estimated at over 33,000 miles, and hence its volume is 74 times that of the earth. The density is, however, only ·17 (the earth's being unit), so that the mass exceeds the earth's mass in the ratio of 12½ to 1. It is hardly possible to observe the time of axial rotation on account of the great distance of the planet; but it has been asserted that the length of its day is between 9 and 10 hours. Four satellites are certainly known. Herschel, however, records the discovery of six; and as two of the recognised ones are quite irreconcilable with any of these, it has been suggested that there are really eight. It is hardly probable, however, that more modern astronomers with their superior instruments should have failed to detect these recorded satellites did they exist; so that it seems likely that Herschel, even with his extraordinary powers of observation, was in this instance mistaken.

Uras'ter, a genus of *Echinodermata*, belonging to the order *Asteroidea*, and including the common star-fish of British coasts (the *Uraster rubens*), along with other species. The disc or body is small, and the arms usually five. The genus U. appears in a fossil condition first in the Oolitic rocks, and has persisted from that period to the present day.

Ur'ban, the name of eight of the Popes.—**U. I.** (date of his pontificate, 223–230) suffered martyrdom.—**U. II.** (Odo of Lagny, 1088–99) was a man of energy and decision of character, and did much to increase the temporal power of the papal see. In 1089 he held a council at Rome at which he excommunicated the Emperor Heinrich IV., together with Clement III. the rival pope, supported by him. In 1090, at a council at Melfi, he caused it to be declared that the laity could not on any pretext establish a right of jurisdiction over the clergy. At the Council of Clermont, in 1095, he further asserted the external authority of the Church and its internal dependence on the central authority at Rome. At this council, too, he fanned into flame the enthusiasm of Latin Christendom for the recovery of the Holy Sepulchre from the infidels. The first crusade (1096–99), ending in the capture of Jerusalem, was the result. U. died at Rome, 29th July 1099. We have fifty-nine of his letters in the *Concilia* of P. Labbé.—**U. III.** (Lambert or Hubert Crivelli, 1185–87) passed his brief pontificate in bitter but indecisive conflict with the Emperor Friedrich Barbarossa—**U. IV.** (Jacques or Hyacinthe Pantaleon, 1261–64), a Frenchman of Troyes in Champagne, spent the three years of his papal rule in attempts to prevent Konrad, the last of the Hohenstaufens, from succeeding to the imperial throne. He wrote a 'Description of the Holy Land,' and sixty-one of his letters are given in the *Thesaurus novus Anecdotorum* by PP. Martène and Durand. See Courtalon-Delaistre's *Vie du Pape U. IV.* (Troyes 1782).—**U. V.** (Guillaume de Grimoard, 1362–70), the last of the popes who resided at Avignon. His pontificate also was troublous, much of his time being passed in not very successful struggles against the Visconti and other powerful lords and princes of the period. Some of his letters are given in the *Thesaurus novus Anecdotorum*.—**U. VI.** (Bartolommeo Prignani, 1378–89). The somewhat rash and inconsiderate reforming zeal of this pope caused the cardinals of the conclave to declare that his election was invalid, and to choose a rival pope, Clement VII., only six months after the election of U. This caused a great schism throughout the Church, the result of which was a conflict that lasted through

the whole of U.'s pontificate. In this conflict U.'s violent disposition gave him a great disadvantage. He died, 15th October 1389, under somewhat suspicious circumstances, and it was generally believed that he had been poisoned.—**U. VII.** (Giovanni Battista Castagna) died 27th September 1590, twelve days after his election and before his consecration.—**U. VIII.** (Maffeo Barberini, 1623–44) was much occupied with the defence of the temporal power. To this end he helped France against Austria and Germany, and was thus brought into somewhat close relations with the German Protestants. He was active also as a priest. He founded the Propaganda (1627), suppressed the order of female Jesuits (1631), caused a new edition of the Romish Breviary to be published, and condemned the theories of Galileo (1633). U. was a zealous patron of art and literature, spoke Greek and even Hebrew with elegance, and was moreover a sacred poet of some merit. Editions of his works have been published at Antwerp (1634), Paris (1642), and Oxford (1726). See *Sylvæ Urbanianæ seu Gesta U. VIII.* (1657).

Urbi'no, a town in the Italian province of Pesaro e U., 20 miles S.W. of Pesaro, on a hill between the Metauro and the Foglia. A market-place occupies the centre of the town. Near it is the cathedral containing valuable pictures, and the Ducal Palace (1477), a magnificent specimen of early Renaissance architecture, with fine-art treasures. The university, founded in 1671, with fifty students in 1877, the Institute of Fine Art, with twenty-nine students in 1877, a library and several important educational institutions (including a normal school with 11 professors and 29 students in 1877), are the other chief buildings. U. manufactures cheese, silk, needles, pottery, and majolica ware. U. was the birthplace of Raffaele Santi, and the house where he was born still stands and was recently repaired. A monument was erected to his memory in 1877. Pop. (1874) 5162, including surrounding villages 16,000. The *Urbinum Hortense* of the Romans, U. was a notable *municipium* in the time of Julius Cæsar. In 1205 U. came under the Counts of Montefeltre, who by Pope Sixtus were made Dukes of U. and were papal vassals. U. was directly under the Popes from 1631 to 1860, when it passed to the kingdom of Italy. See Dennistoun's *Memoirs of the Dukes of Urbino.*

Ur'chin, Sea. See ECHINUS.

Ure, Andrew, M.D., F.R.S., a Scotch chemist, was born at Glasgow, May 17, 1778. He graduated in medicine at Edinburgh University in 1801, became professor of chemistry at the Andersonian Institution at Glasgow in 1804, and was made director of the newly-formed Glasgow Observatory in 1809. In 1830 he removed to London, was appointed analytical chemist to the Board of Customs in 1834, and soon acquired a high reputation both as an investigator and an author. He died in London, January 2, 1857. His chief works are *A New Systematic Table of the Materia Medica* (1813); *A Dictionary of Chemistry* (2 vols. 1821); *A New System of Geology* (1829); *The Philosophy of Manufactures* (1835); *The Cotton Manufacture of Great Britain* (2 vols. 1836; 2d ed. 1861), and a *Dictionary of Arts, Manufactures, and Mines* (2 vols. 1837–39). This last work, rewritten and enlarged by Dr. Robert Hunt (3 vols. 1859-60; 7th ed. 1875, Supplement 1878), is still a recognised authority upon questions relating to the practical bearings of chemistry.

Urea (COH_4N_2), an organic compound forming the characteristic ingredient of urine, from which it was originally obtained. By acting upon concentrated urine with oxalic acid a crystalline solution of the oxalate of U. is obtained, which when dissolved in boiling water and neutralised with carbonate of lime yields solution of U. easily separated from the insoluble calcium oxalate by filtration, and finally concentrated by evaporation, and precipitated by cooling in transparent colourless four-sided crystals. Another process consists in treating the concentrated urine with strong nitric acid, decomposing the nitrate of U. so formed by barium carbonate, and finally dissolving the U. by boiling alcohol, from which the crystals separate out on cooling. U. has a cooling saline taste, is inodorous, and permanent in dry air. It is soluble in an equal mass of cold water, not so soluble in hot, dissolves readily in alcohol, but is insoluble in ether. It fuses at 120° C., and at higher temperatures decomposes into ammonia, cyanate of ammonium, and cyanuric acid. Heated with water in a sealed tube, it yields carbonic acid and ammonia. A solution of pure U. shows no tendency to change by keeping, but if it is associated with putrefiable organic matter it readily decomposes. Hence in putrid urine U. does not exist, but instead there is ammonium carbamate ($CO_3(NH_4)_2$) which contains the elements of U. *plus* two molecules of water. U. may also be formed artificially in a variety of ways, one of the simplest being by heating ammonium carbamate ($CO_2N_2H_6$), which contains one molecule of water less than the carbonate. Hence U. is regarded by Kolbe and other chemists as being the *amide* of carbamic acid, *i.e.*, formed from the acid by substituting amidogen (NH_2) for hydroxyl (OH), or by abstraction of water from the corresponding ammonium salt. Thus the formulæ of carbamic acid and U. may be represented thus—



$$CO\begin{cases}NH_2\\OH\end{cases} \qquad CO\begin{cases}NH_2\\NH_2\end{cases}$$

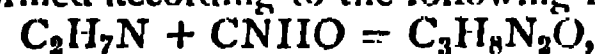
Carbamic acid. Urea.

A convenient method of preparing U. is to add to strong solution of potassium cyanate an equal quantity of dry ammonium sulphate, evaporate the whole to dryness, and boil the residue with strong alcohol, from which U. crystals separate out on cooling. Its preparation by the action of cyanic acid upon ammonia, as effected by Wöhler in 1828, is interesting as the earliest synthetic formation of an organic compound. The solution of cyanate of ammonium, formed in the first instance when evaporated, yields the U. crystals



$$NH_3 + HCNO = CH_4N_2O.$$

The various amine bases, which are derived from ammonia by replacing one or more hydrogen atoms by corresponding molecules of the alcohol radicals, such as ethyl, methyl, amyl, &c., when treated similarly with cyanic acid, yield a series of substances called the *compound ureas.* Thus from ethylamine, ethyl-urea is formed according to the following reaction:



$$C_2H_7N + CNHO = C_3H_8N_2O,$$

and similarly for methyl-urea, methyl-ethyl-urea, and a great number of similar and even more complex substances. These compound ureas were first systematically studied by Hofmann.

Ure'do, a genus of Fungi formerly including all those now classified under the section *Uridinei* of the natural order *Puccinæi.* This order, in Berkeley's arrangement, has been extended to embrace those parasitic species in which the spawn or vegetative part is reduced to a minimum, and the abundant spores at length form a dusty or more rarely a gelatinous mass. Some of the species, as mildew (see PUCCINIA) and Smut (q. v.), are cosmopolitan. In the section *Uridinei* and *Ustilaginei* the protospores are mostly unicellular, and in the first are disposed in regular orbicular or elliptic masses or *sori;* in the second they form irregular profusely dusty masses. U. in its restricted range has brown or yellow protospores, respectively seen in the common species *U. circæ* and *U. confluens,* which infest the enchanter's nightshade and the dog's mercury.

Ure'na, a genus of rigid tall herbs or shrubs with small pink flowers, belonging to natural order *Malvaceæ.* Besides *U. lobata* and *U. sinuata,* which are common in all tropical regions and are weed-pests in some parts, the genus comprises two or three species confined to tropical Asia. All possess mucilaginous properties, for which some are used medicinally, and the inner bark of some yields an abundance of fibre suitable for gunny bags.

Ure'ter (Gr. *ouron,* 'urine,' and *tērein,* 'to keep'), the excretory duct of the kidneys or tube by which the *Urine* (q. v.) is conveyed to the bladder. The average length of the human U. is from 16 to 18 inches. In thickness the U. attains the dimensions of a goose-quill. It consists of three coats; an outer or fibrous coat, a middle or muscular layer, and an inner or mucous layer.

Diseases of the U.—The most frequent disease of the U. is that caused by the passage of a concretion, formed in the kidney, along the U., towards the bladder. The patient complains of sudden and severe pains in the loins and groin, in the testicles and thigh; and the testes are contracted spasmodically. There is also severe sickness, faintness, and collapse, which may last for several days, or until the calculus has reached the bladder. The patient should be put into a warm bath, chloroform may be administered, and opium or belladonna may be given in full doses. Diluents, such as barley or rice water, may be freely given to wash down the concretion, and fomentations may be applied externally.

Ureth'ra (Gr. the 'urine-passage'), the canal leading from the bladder to the external surface of the body. In the male it attains a length of from 8 to 9 inches, and is divided by anatomists into a *prostatic* or wide portion, a *membranous* part, and a *spongy* portion. The U. consists of three coats, named mucous, muscular, and erectile.

Malformations and Diseases of the U.—The most common diseases of the U. are gonorrhœa and stricture, the special inflammatory conditions of its mucous membrane.

Ur'fa, the modern name of Edessa (q. v.).

Urfé, Anne d', born in Le Forez of an ancient family in 1555, succeeded his father as bailiff of his native country (1574), and having formed an unhappy union with Diane de Château-Morand (annulled in 1598), took orders in 1603, and died in 1621 a canon of Lyon, vicar-general, and prior of Montverdun. The five sonnets published from his *Diane* (1572), and the first book of his *Hymnes* (1608), leave us well content that the bulk of his poems have remained in manuscript.—**Honoré d'U.**, his far more celebrated brother, was born at Marseille, February 11, 1568, and studied at the College of Tournon. A brave adherent of the League, he was twice taken prisoner, in prison commencing his *Epistres Morales* (1598); in 1600 he married his brother's wife, his seven years' senior, that thereby her wealth might not be lost to the family. He fared no better than his brother, and, disgraced at court, retired to Piémont, whence in 1610 he issued part of his famous romance, *L'Astrée.* Modelled on Tasso's *Aminta* and the *Pastor Fido* of Guarini, this work, with its medley of prose and verse, of shepherds, knights, and enchanters, of history and mythology, had a great but now scarce intelligible success. La Fontaine tells how he read it in childhood, and came back to it when his beard was grey. Its second and third parts appeared in 1612 19, the two last were published posthumously by the secretary of d'U., who died at Villefranche in Piémont, June 1, 1625. The latest edition of *L'Astrée* was the Abbé Souchay's (Par. 1733), and translations of it exist in nearly every European tongue. See Bernard, *Les d'U.* (Par. 1839); and Demogeot, *Histoire de la Littérature Française* (12th ed. Par. 1873).

U'rga (Mongol. *Bogdo-Kuren*, 'holy camping-place'), the largest town of N. Mongolia, and the capital of the Khalka Mongols, is situated on the Tola, an affluent of the Orgon, 185 miles S. of Kiakhta. U. is the centre of the Chinese government of N. Mongolia, and since 1604 has been the seat of the high priest (*Kutuchta*) of the Buddhist Mongols. The inhabitants, 30,000-40,000 souls, consist of Lamas (about 10,000), Chinese merchants, officials, and soldiers. Russia maintained here a garrison from 1870-72, and is now represented by a consul.

U'ri, one of the three original Waldstätten cantons of Switzerland, is bounded N. by Schwyz, E. by Glarus and the Grisons, S. by Ticino, and W. by Valais, Bern, and Unterwalden. Area, 415 sq. miles; pop. (1877) 17,041, almost wholly Catholic and German. The mountain system, attaining its greatest elevation in Dammastock (11,910 feet), belongs to the Bernese and Glarner Alps, and is traversed by the St. Gothard Pass, near which a tunnel is now (1879) in course of construction (see TUNNELS). Cattle-rearing is the staple industry, and there is a thriving trade in butter, cheese, hides, and wood. In 1877 the revenue amounted to 479,555 francs, the expenditure to 461,658, and the public debt to 10,722,214 francs. Altorf (q. v.) is the capital. See Lusser's *Geschichte des Cantons U.* (Schwyz 1862).

U'ric Acid ($C_5N_4H_4O_3$), an acid present in the urine of certain animals, and in the solid white excrement of serpents, which consists almost entirely of U. A. and ammonium urate. It is also one of the commonest varieties of urinary calculi, hence its former name *Lithic Acid.* It may be obtained by adding hydrochloric acid to concentrated human urine, from which it crystallises out after some time in the form of small reddish grains very difficult to purify. When pure, U. A. forms a glistening snow-white powder, which under the microscope is seen to consist of minute crystals. It has no taste or smell, and is very sparingly soluble. Its most characteristic chemical feature, by which it may be recognised even when in small quantity, is its action with nitric acid, dissolving in the latter with copious effervescence. The solution, when dried and treated with caustic ammonia, assumes the characteristic deep red tinge of murexide ($C_8N_6H_8O_6$+Aq). U. A. is dibasic, its most important salts being those of the alkali metals, which are all sparingly soluble, and appear as urinary deposits indicating an unhealthy condition of the body. Guano, now imported in large quantities into Britain for use as a manure, is mainly impure U. A. in a remarkable state of decomposition. U. A. has not yet been formed artificially. Chemically, it is remarkable for the facility with which it yields definite and crystallisable organic compounds when treated with oxidising agents, the most important of which are urea, alloxan, uroxanic acid, difheau, alloxantin, parabanic acid, uramil, allanturic acid, &c. These derivatives were first systematically investigated by Liebig and Wöhler, and are important in their medicinal bearings.

U'rim and **Thumm'im**, carried by the High Priest among the Jews, were two objects used by him when consulting the Deity. Some consider that U. and T. was only another name for the breastplate worn on the Ephod (q. v.), but in certain passages they are evidently distinguished from it (Exod. xxviii. 30; Lev. viii. 8; *cf.* Josephus, *Ant.* viii. 3, 8). Whatever may have been the form of the objects, it appears from 1 Sam. xiv. 3, 18, 41, 42, that they were used for casting lots. According to Philo, they were two images of Light (revelation) and Truth (*cf.* Hos. iii. 4, where *teraphim* are mentioned along with the ephod).

U'rine, the fluid excreted from the blood of the Kidneys (q. v.), and which represents in itself the larger portion of the *nitrogenous waste* of the body. The U. passes from the kidneys to the bladder through the *Ureter* (q. v.), and is thus finally got rid of from the system. The subject of the U. may be conveniently discussed in the following order: (1) the characters, physical and chemical, of healthy U.; (2) the conditions affecting the quantity of this secretion; (3) the manner of its excretion by the kidneys. Healthy U. appears as a straw-coloured fluid, possessing at the most a faint aromatic odour. During decomposition this odour becomes strongly ammoniacal, and the fluid itself becomes turbid from the deposition of matter held originally in solution. Only in disease is the U. turbid when expelled at its own normal temperature of 98° or 100° F. At first the U. presents an acid reaction, but by the development of ammonia during decomposition it becomes markedly alkaline. In herbivorous animals the U. is normally alkaline, and generally turbid, a peculiarity depending on the diet, as is found indeed by the U. of carnivorous animals becoming turbid when fed on plant-materials. The *specific gravity* of human U. is about 1·020, but is liable to much variation. From 1·015 in the winter to 1·025 in summer are the usual limits in the variation of healthy U. In some diseases the specific gravity sinks very low. In albuminuria it may stand at 1·004; and in sugary U. or diabetes may ascend as high as 1·050 or 1·060. In 1000 parts of U. 967 parts of water exist, the remaining bulk being composed of (on an average estimate) urea (14·230), uric acid (·468), colouring matter, mucus, &c. (10·167), chemical salts (*e.g.*, sulphates and chlorides of sodium and potass, biphosphates of calcium, sodium, magnesium, ammonium, hippurate of sodium, and fluoride of potass) 8·135, and silica (traces). In twenty-four hours the following are the average quantities of these matters secreted by a healthy male adult: water, 52 fluid oz.; urea, 512·4 grs.; uric acid, 8·5 grs.; hippuric acid, 10 to 15 grs. (?); sulphuric acid, 31·11; phosphoric acid, 45·0 grs.; chlorine, 105·0 grs.; chloride of ammonium, 35·25 grs.; potash, 58·0 grs.; soda, 125 grs.; lime, 3·5 grs.; magnesia, 3·0 grs.; mucus, 7·0 grs.; extractives, 154·0 grs. In any given quantity of healthy U. the quantity of solids may be roughly estimated by doubling the last two figures of the specific gravity. Thus, assuming that 1025 is the specific gravity of the U., then 2×25 gives 50 grs. of solids per 1000 grs. of U. *Urea* is the most important ingredient in U., and represents in itself the chief nitrogenous waste of the frame.

The conditions affecting this secretion and its quantity are—1. The absence or presence of fluids in the food. *Urina cibi* is the U. which is secreted after a solid meal, in which fluid the solids attain a greater preponderance than at other times; *urina potus* is the U. secreted after drinking, where the solids are diminished; and the *urina sanguinis* is that secreted when neither food nor drink has been taken. 2. *Blood pressure* affects the quantity of U. secreted, since whatever increases the flow of blood through the *renal arteries* will increase the quantity of U. secreted, and *vice versâ.* 3. The *period of the day* will affect the U. and its secretions, as also will the *taking of food.* As a rule, U. is secreted more rapidly after meals; less rapidly

during fasting. During sleep the secretion of U. probably reaches its minimum. 4. The *influence of the nervous system and exercise* together affect the secretion of U. very materially. When the skin does not act typically in secretion, as is the case with sedentary persons, the kidneys secrete a greater quantity of U. In summer, when the skin is most active, less U. is secreted than in winter.

The *manner in which the U. is secreted* by the kidneys will best be understood by a reference to the structure of the KIDNEY, described in the article of that name. The *renal arteries* and their capillaries distribute continually a large amount of blood through these glands, and the *Malpighian bodies* or *corpuscles* of the kidney, together with their secreting cells, separate the U. from the blood which circulates through their structures. The U. passes into the bladder in drops, the flow being increased in deep inspiration or during exercise, and also after a meal.

Incontinence of U., or Eneuresis, is a common affection of childhood, which generally yields to domestic management, such as raising the child frequently during the night, withholding fluids during the evening, and the cold hip-bath. The cold douche to the spine is also serviceable, and a blister over the sacrum has been recommended. Belladonna, in doses varying from $\frac{1}{12}$th to $\frac{1}{8}$th of a grain, according to the age of the patient, may be given twice daily, increasing it if required till it produces its constitutional effects. Benzoic acid and chloral are also given in nocturnal incontinence. Ergot is also a valuable remedy in certain cases. Sir Henry Thompson says that in obstinate cases the application of a solution of the nitrate of silver, 10 grains to the ounce, to the neck of the bladder may be beneficial. I. of U. almost always subsides before the patient grows up.

U. in Disease.—The U. in disease may be considered (1) as regards excess or deficiency in any of the normal constituents; and (2) as regards the characters of certain soluble substances, which are never met with in a state of health. *Excess of water.* There are certain affections in which the quantity of water eliminated from the body is greatly increased, such as hysterical affections, and other emotional states. In such conditions the specific gravity of the U. is low. An excess of U. may contain an excess of disintegrated tissue, rendering the specific gravity of the U. normal; but an unusually large quantity of U., of a very high specific gravity, is characteristic of the existence of Diabetes (q. v.). *Deficiency of water* is generally associated with an abnormal quantity of solid matter, usually urea; but when the percentage of solid matter is low, albumen is generally present, and the secreting structure of the kidneys is much impaired. *Acid* U. In chronic and acute diseases the quantity of free acid is generally diminished; but in many cases of pneumonia and rheumatic fever the quantity of free acid is increased. Acid U. may cause the precipitation of uric acid, and of urates in the bladder leading to the formation of Calculus (q. v.); and it may cause irritable bladder, and give rise to a constant desire to void U. *Alkaline* U., in some cases of dyspepsia, arises from the secretion of an abnormal amount of acid by the stomach; and the degree of acidity of the U. may, to a certain extent, be regarded as a measure of the acidity of the stomach. *Excess of urea* is present in those cases in which a specimen of U. yields crystals of nitrate of urea when an equal bulk of nitric acid is added to it in the cold, *without having been previously concentrated. Deficiency of urea* has been observed in cases of ovarian disease and cancer of the uterus. In chronic disease of the kidney, the U. is of low specific gravity, and contains a small proportion of urea. *Uræmia,* depending on the retention of the excrementitious urinary substances in the blood, generally results from long-continued organic disease of the kidneys, but it may depend upon acute disease. *Ammonia* in small quantity passes into the U. from the blood; but in cases of disease it arises from decomposition of U. in the bladder, though more frequently after it has left the bladder. *Colouring matters* formed in the body and excreted in *solution* in the U. are probably derived from the blood corpuscles undergoing disintegration, and from the extractive matters. *Uric acid and urates* usually form urinary deposits, either from existing in too large a proportion to be dissolved in the U. when cold, or from the development of an acid in the U. which causes them to be precipitated from their solutions. In acute febrile diseases there is an excess of uric acid, and in the period of resolution of the inflammation there is an abundant deposit of urates. In gout, uric acid is constant in the blood. *Hippuric acid* is often found in large quantity in diabetes, and seems to take the place of uric acid. *Extractive matters* in U. are entirely excrementitious, and in certain cases there is an extractive matter which has drained away from the blood, and may be detected by the abundant precipitate thrown down on the addition of tincture of galls.

Excess or deficiency of the inorganic constituents.—In *pneumonia,* at the period of hepatisation, there is a total absence of *chloride of sodium;* but after the period of resolution it reappears. The absence of this salt may depend on a determination to the inflamed lung, and reappearance of the salt in increased quantity may depend upon reabsorption. In chorea, rheumatic fever, and in many cases of skin diseases, there is a marked increase in the *sulphates.* It has been conjectured that the quantity of phosphates in the U. varies according to the amount of nervous tissue disintegrated; and that the quantity of work done by the brain is in direct proportion to the activity of the changes occurring in the nervous tissue. The proportion of *earthy phosphates* in the U. does not vary much in disease, but there is an increase in some diseases, as *Mollities ossium.*

Soluble substances which do not exist in healthy U.—Albumen does not exist in the U. of healthy persons, though it may be occasionally present for a short time. *Sugar* in the U. is a prominent symptom of *Diabetes Mellitus* (q. v.); but traces of it are often found in healthy U. It is sometimes present in cases of fatty, wasted liver, pneumonia, phthisis, cholera, and carbuncle. The remaining abnormal constituents of urine are *alkapton, leucine, tyrosine, inosite, acetone, cystine, taurine,* and *hypozanthin. Fatty matter* is found in what is termed *chylous U.;* but the disease is very rare in this country. See Dr. Beale, *Kidney Disease, Primary Deposits, and Calculous Disorders* (Lond. 1869); and Dr. Thudichum, *The Pathology of the U.* (Lond. 1858; new ed. 1877).

U'rmia, a prosperous town of Persia, province of Azerbijan, in a fertile plain, 12 miles W. of Lake U., and 112 miles S.W. of Tabriz. The plain of U. is 50 miles long and 18 miles wide, and is populous and fertile, being well watered by the streams that descend from the Kurdish mountains. The town is girt with a mud wall and moat, and is surrounded for 12 miles round with gardens intermingled with melon, citron, and tobacco grounds. Pop. 35,000 (2000 Jews).

U'rmia, Lake of, a salt lake in Azerbijan, Persia, 3900 feet above sea-level, with a length of 90 miles, a breadth of 30 miles, and a circumference of not less than 250 miles. It contains 6 large and about 50 smaller islands, and receives 14 streams, of which the largest are the Jagatu, Tatau, Sefichai, and Ajichai. It has no apparent outlet. The depth for 2 miles does not exceed 3 feet, the average depth is under 12 feet, the greatest depth ascertained 45 feet. The water is so largely impregnated with salt that no fish can live in it, and the banks are covered with a thick saline incrustation, from which a salt of beautiful transparency is obtained for commerce.

Uro'dela. See NEWT.

Ur'quhart, Thomas, Sir, a Scottish author, best known as the translator of Rabelais, was born probably in 1605. He spent some time in foreign parts while as yet his 'brains were unripened for eminent undertakings,' visiting Spain, France, Italy, and Sicily. In 1639 he was present in Scotland at the battle called the Trott of Turiff, and he shortly afterwards entered the service of Charles I., by whom he was knighted in 1641. On his father's death in 1642, he handed over his Scotch estates at Cromarty to trustees and went abroad; but in 1645 he was obliged to come back to Scotland to look after his affairs, and spent some years in a contest with his creditors. After the execution of Charles I. he joined the royalists, and in March 1649 he was declared a rebel by the Estates at Edinburgh. At the battle of Worcester he was taken prisoner, but he was afterwards released; and after a vain attempt to recover his rightful position in Scotland he escaped to the Continent, where he is said to have died in a fit of laughter at the news of the restoration of Charles II. His translation of the first two books of Rabelais, which appeared in 1653–64, and has been frequently reprinted, is a masterpiece in its style; but his other works are mainly interesting for the strange picture they afford of the writer's mental peculiarities. They were reprinted in one volume of 412 pages for the Maitland Club in 1834:—*Epigrams, Divine and Moral* (1641); *The Trissotetras, or the Most Exquisite Table*

for Resolving all Manner of Triangles (Lond. 1645); *Pantochronochanon, or a Peculiar Promptuary of Time*, tracing the descent of the Urquharts of Cromarty from the Creation (Lond. 1652); *Ekskybalauron, or the Discovery of the Most Exquisite Jewel* (Lond. 1652), written as a vindication of the honour of Scotland, and remarkable for the sketches of Chrichton and other eminent Scotchmen; and *Logopandecteision, or an Introduction to the Universal Language* (Lond. 1653).

Ur'sa Ma'jor, or the Great Bear, one of the forty-eight constellations of Ptolemy, is situated in the northern hemisphere, not far from the N. pole. It is readily recognised by its seven conspicuous stars, four of which form a quadrilateral, and because of the general configuration of these it is popularly known as the Plough or Charles' Wain or Waggon. A line drawn through the last two stars of the quadrilateral passes very near the Pole Star—hence the name given to them, *the pointers*. *Septentrio*, the Latin for U., is evidently derived from these seven stars. *Ursa Minor*, the Lesser Bear, is a generally inconspicuous constellation, in which the Pole Star forms the tip of the tail.

Ur'sidæ. See BEAR.

Ur'son, or Cana'dian Por'cupine (*Erethizon dorsatum*), a genus of *Rodent* quadrupeds, belonging to the family *Hystricidæ*, or that of the Porcupines. The quills are much less typically developed than in the common porcupine. The head is small and flat, and the hairy covering of the body is greater than in the ordinary porcupines. The U. is met with in Virginia and Kentucky as its southernmost limits. In size it attains the length of a foot and a half.

Ur'sula, St., and the Eleven Thousand Virgins, a very curious legend of the Middle Ages, whose origin we may ascribe to the 12th c., and which runs as follows. Deonatus, King of Britain, had a very beautiful and pious daughter named U. She was sought in marriage by the heathen prince Holofernes. His suit was granted, but under the following conditions—the prince must become Christian, and wait for three years whilst the bride-elect went with her companions on a pilgrimage to Rome. The suitor was immediately baptized under the name of Ætherius, and U. set out with eleven vessels, in each of which there were a thousand companion virgins. The company crossed the sea and sailed up the Rhine as far as Basel, from thence they proceeded overland to Rome, where they were honourably received by Pope Cyriakus. The pious and gallant pontiff, along with a multitude of dignified ecclesiastics, accompanied his fair guests a great part of the return journey, and according to some accounts even shared in the final destruction that suddenly overtook the band; for as they were about to land at Koln they were set upon by a horde of heathen Huns, by whom they were all slaughtered. U. was at first reserved as a bride for Etzel, the Hun king, but on her steadfast refusal of the offer she was transfixed by an arrow, and thus she is represented in mediæval art. But the bloody deed was no sooner accomplished than 11,000 celestial warriors appeared, who completely routed the Huns and freed Köln. The citizens buried the unhappy maidens with pious care by the Rhine, held afterwards sacred, and there too Clematius, a Greek pilgrim, built a church in their honour.

The story excited suspicion even in a credulous age. But confirmations were not wanting. St. Elizabeth, abbess of the cloister Schönau, by Oberwesel, held spiritual communication with St. Verena, one of the murdered virgins, and saw the whole tragedy enacted as in a vision. Moreover, Egbert, brother of the abbess, and inspired by her, wrote down an explanation and defence of the story. In this several awkward inconsistencies were smoothed away. Thus there was no mention by Roman chroniclers of a Pope Cyriakus; but this (explained the narrator) was because the cardinals were angry at his leaving the city, and blotted out all mention of him from the records of the Church. If it was asked how the virgins made such excellent sailors, it was replied that King Deonatus had with prudent foresight concealed a number of mariners in the hold of each vessel, and so on. Later critics have striven to explain the vastness of the number. It has been ingeniously conjectured that the number, at first 11, became 11,000 by reading the letter M. (meaning martyred) as the Roman numeral 1000. However this may be, it seems probable that some Christian maidens were really murdered by heathen invaders near Köln, and that the story has thus some basis of fact. No one who is familiar with the literature of the Middle Ages will be surprised at the extravagance of the legend. See Crombach, *U. vindicata* (Köln 1647); Schade, *Die Sage der Heligen U.* (Han. 1854); *Legend of St. U.* (Lond. 1869).

Ur'sulines, The, were one of those religious orders which resulted from the rise in the Romish Church of the evangelical zeal which was so remarkable a reflex effect of the Reformation. Angela or Angelica Merici (1470-1540), a poor maiden of Desenzano, was their founder. She began in that town, and continued afterwards in Brescia, the education of poor children. At the grave of Varallo at Milan, a favourite resort of pilgrims, she was inspired with the determination to found a new religious order, and at the celebration of the mass in the St. Afra Church at Brescia, on the 25th November 1535, the order, as a free union without binding vows, was solemnly inaugurated. Its object was the performance of certain church and household devotions, the instruction of young females, and the bodily and spiritual care of the poor and sick. The order was to be immediately under the supervision of a priest and matron, and Angelica was herself chosen as first matron on 18th March 1537 by the 76 members of the society, and as such she watched over the affairs of the order till her death, three years later, when she was succeeded by the Countess Lucrezia of Ladrone. On 9th June 1544 the order received papal sanction from Paul III., and in 1584 it had increased to 600 nuns in 18 establishments. It quickly spread itself from Italy into other lands, and at the beginning of the 18th c. had 20 congregations, 350 convents, and from 15 to 20,000 nuns. It was not quite the same in all countries, and was never bound together so strictly as other religious orders were. No general assembly or provincial chapters were held, so that each settlement of the U. stood under the power of the bishop of the diocese. One of its latest developments was the congregation of Chavagnes, in La Vendée, founded by Demoiselle Brechard in 1805, and containing, in 1862, 300 to 400 sisters in about 30 houses. See *Les Chroniques de l'ordre des U.* (Par. 1676); *Journal des illustres Religieuses de l'ordre de Ste. Ursula* (Par. 1690); *Auf.-und Fortgang des jungfraülichen Ursulenerorden durch G. A. Mayer* (Wurzb. 1692).

Urtica'ceæ, or **Urti'ceæ**, a natural order of apetalous dicotyledons, either herbs, shrubs, or trees, with watery juice, alternate or opposite leaves, and small green unisexual flowers. There are about 500 recognised species, comprised in 43 genera. U. is represented in all climates, but principally temperate and tropical, and mainly in the latter. A characteristic of the order is the valuable fibre of the inner bark. See BOEHMERIA and RHEEA FIBRE. Sometimes the plants bear stinging hairs, as in the common British Nettle (q. v.) and the Neilgherry Nettle (q. v.). None of the species are medicinal.

Urtica'ria. See NETTLE RASH.

Uruguay', a large river of S. America, rises in Brazil in 28° 40′ S. lat., only 100 miles from the Atlantic, and flows successively N.N.W., S.S.W., and S. till it unites with the Parana (q. v.), to form the Rio de la Plata. The total length of the U. is about 900 miles, but shoals and rapids prevent large vessels from ascending it beyond Concordia, 200 miles from its mouth. It has a rapid current, and a volume nearly as great as that of the Parana, to whose turbid waters its clear stream presents a marked contrast at their junction. For nearly three-fourths of its length the U. separates the Argentine Republic from Brazil and the republic of U. See *The Paraná, the U., and La Plata Estuaries*, by J. J. Révy (Lond. 1874).

Uruguay', a republic of S. America, bounded N. by Brazil, E. by Brazil and the Atlantic, S. by the Rio de la Plata, and W. by the Argentine Republic. Its area is 72,151 sq. miles, and its pop., at the census of 1878, 440,000. The southern half of the country is rolling and open, with few trees, and traversed by low ranges of hills. N. of the Rio Negro, the country is still little known, but is more hilly and wooded. The streams are commonly lined by dense thickets, in which lurk the jaguar and ounce, and the other wild animals include the tapir, deer, fox, and dog. Sheep were formerly reared in great numbers, and their wool was much esteemed, but of late years the sheep-farming interest has greatly declined, the sheep giving place to cattle, for which the coarse pastures of the country are better suited. Owing to the insecurity of life and property, labour is very scarce, and agriculture is consequently limited, but the soil and climate are alike

most favourable for the growth of wheat, maize, cotton, tobacco, and the vine. Beef, jerked and salted, extract of meat, hides, horns, hair, tallow, wool, and feathers, are the chief exports, whose value in 1875 was £2,644,591, while that of the imports was £2,800,416. In 1878 there entered at ports of the United Kingdom, 48 vessels of 17,535 tons employed in the trade with U., and cleared 220 of 157,649. A central line of railway 130 miles long connects Monte Video (q. v.), the capital, with Duragno, and is being slowly extended westward to Higueritas, near the mouth of the river U., 136 miles distant. In the N.W. a railway is being made parallel to the same river, from Salto to Santa Rosa (108 miles). The country is divided into nine departments, and next to the capital the most important towns are Colonia and Maldonado, both on the S. coast. U. was first settled by colonists from Buenos Ayres, and after a contest for possession between Spain and Portugal, was attached to the former's vice-royalty of Buenos Ayres with the name of *Banda Oriental* ('eastern bank') *del U.* Its independence as a republic was secured by a treaty dated 27th August 1828, and its subsequent history is a miserable record of perpetual civil war and growing financial difficulty. See Petermann, *Die Sudamerikanischen Republiken, Chili, Paraguay, and U.* (Gotha, 1873); Diaz, *Notice historique et statistique sur la République Orientale de l'U.* (Par. 1878); Muthal, *Handbook of the River Plate Republics* (Lond. 1878).

U'rus, a species of wild oxen, popularly named the 'Mountain Bull,' and supposed to be the immediate progenitors of the famous Chillingham cattle. The U. existed in a wild state and in large numbers in Gaul at the period of its invasion by Cæsar, whose description of the animal is obviously exaggerated.

Usamba'ra, a country of E. Africa, lying between 4° 20'—5° 25' S. lat., and 38° 20'—39° 10' E. long. Its most southerly point is only 50 miles N.W. of the city of Zanzibar (q. v.). U., which has been called 'the Switzerland of Africa,' is a mountainous country traversed by four parallel ranges running N. and S., and forming a part of the great coast-range which stretches from Abyssinia to Natal. The mountains, which are of volcanic origin, reach a maximum height of 6000 feet, and are usually clothed with trees to their summits. The country is well watered, the soil extremely fertile, the vegetation luxuriant, and the scenery of the loveliest description. A level plain 30 miles wide separates the mountains from the sea. Rice, maize, semsem seed, indiarubber, and tobacco are exported, and cotton of good quality is also indigenous, but is not cultivated. The country, lying on the shortest route to Lake Victoria Nyanza, is likely to rise in importance as the civilisation of Eastern and Central Africa advances. See the *Proceedings of the Royal Geographical Society for* 1879.

Use, at common law, was a beneficial interest in land distinct from the ownership, introduced from the civil law by the clergy. The device was to convey land to some one for the U. of the Church. In this way the prohibition against Mortmain (q. v.) was avoided.

Use and Occupa'tion, a term of English law denoting the advantage accruing to a tenant from occupying the premises of his landlord. When there has been no lease, or when the terms of the contract of letting are ambiguous, the proper mode to recover rent is by an action for U. and O. An action cannot be maintained for the rent of premises let for an illegal purpose; and an immoral purpose is illegal.

U'sedom, an island of Pommern, Prussia, opposite the harbour of Stettin. Its form is irregular, and with a length of 34 and a breadth of 15 miles, it has an area of 148 sq. miles; pop. 25,000. Swinemünde (q. v.) on its N. and U. on its S. side are the only towns. The latter had a pop. (1875) of 1738.

U'ses and Trusts, in English law, correspond to the *Fidei Commissum* (q. v.) of Roman law.

Ushant (Fr. *Ouessant*), a small island, about 11 miles off the coast of Brittany, gives its name to the group of which it is the largest, all of which are included in the department of Finisterre. U. has an area of about 3800 acres, and affords admirable pasturage for cattle, but contains no wood. A lighthouse has been built upon the island, off the S. coast of which is a dangerous eddy, locally known as the *Fromveur*. Pop. (1872) 2377, all fishers.

Ush'er of the Black Rod, an officer of the Order of the Garter, who usually holds the office of the first Gentleman Usher at Court, in which capacity he is one of the chief officers in the House of Lords. He wields an ebony rod, from which his title is derived, and has a mantle like that of the Garter King-at-Arms. His deputy is called Yeoman Usher, and among the functions devolving upon him or his deputy are the summoning of the Commons to the House of Lords when the royal assent is to be given to bills, and the execution of orders of committal for breach of privilege.—The **Usher of the Green Rod**, an officer of the Order of the Thistle, attends on the sovereign and knights assembled in chapter.

Uskup' (anc. *Skopia*), a town of European Turkey, vilayet of Prisrend, on the river Vardar, and on the Salonika-Mitrovitza railway, 130 miles N.N.W. of Salonika. It is the seat of an archbishop, and has manufactures of leather, and a pop. of 20,000.

U'snea, a genus of lichens with a rounded, branched, and generally pendulous thallus bearing terminal shields (*apothecia*) containing the spores. They grow on rocks and trunks of trees, and from their appearance have obtained the popular name of 'beard-moss' and 'tree-hair.' Some of the large-growing species of the southern hemisphere are very handsome. Three species are British, *U. barbata* being common and multiform.

Ussh'er (commonly **Usher**), **James**, a very eminent scholar and prelate of the Irish Episcopal Church, was born of good parentage at Dublin, 4th January 1581, was educated at Trinity College, took orders in 1601, and continued for some time afterwards at college, where he studied the Fathers with care and zeal. In 1603 he went to England on university business, and remained there three years. In 1607 he was appointed Professor of History at Trinity College; in 1612 he was made Doctor of Theology; and in 1614 Vice-Chancellor of Dublin University. In 1615 a general synod of the Irish Church was held, at which 104 articles of faith were agreed upon. These articles were drawn up by U., and differed much from those of the sister church in England. In 1621 U. was made Bishop of Meath, but he did not long exercise episcopal functions there, for in 1623, having obtained the king's permission, he came to England to study sources of information regarding the history of the early British Church. Whilst there the see of Armagh fell vacant, and in March 1625 U. was appointed Archbishop of Armagh and Primate of all Ireland. U. soon found the honour a burden almost too grievous to be borne. The Roman Catholics were in a state of active discontent, and they nearly succeeded in bullying and frightening the English government into granting them toleration. U. was bitterly opposed to this, for he held that the Pope was Antichrist, and he wrote and preached against it on every opportunity. In 1633 Wentworth, Lord Strafford, came as Viceroy to Ireland, and in pursuance of plans arranged by Laud proceeded to force the Irish Church into closer conformity with that of England, and in this, notwithstanding U.'s opposition, he was to a great extent successful. In 1640 U. left for England. The Civil War almost immediately broke out, and he never returned. Shortly after his arrival at Court he drew up a scheme of reconciliation to unite Churchmen and Dissenters. The concessions which U. proposed showed him to be a man of a liberal and tolerant spirit, at least towards his fellow-Protestants. He passed the greater part of the Civil War in obscurity. From the top of the Countess of Peterborough's house he witnessed with horror the execution of his sovereign. U. died in London, 21st March 1656, and by command of Cromwell was buried in Westminster Abbey. The writings of U., which are tolerably voluminous, may be classified under four heads—1, Apologetical and polemical; *e.g.*, *Gravissimæ Questionis de Christianarum Ecclesiarum in Occidentis præsertim partibus ab Apostolorum temporibus ad nostram ætatem continua successione et statu historica explicatio* (1613), and *An Answer to a Challenge made by a Jesuit in Ireland, wherein the Judgment of Antiquity in the Points Questioned is truly delivered, and the Novelty of the now Romish Doctrine plainly discovered* (1625). The purpose of these and some lesser writings was to show that the pure Church of Christ had existed right on from the death of its Founder apart from the Romish Church. 2. Archæological and church historical; *e.g.*, *Britannicarum Ecclesiarum Antiquitates* (1639, enlarged ed. 1677). This work, the fruit of twenty years' labours, contained an account of the British Church down to the 7th c. To the same class also belong

editions of parts of the Fathers and dissertations on their writings. 3. Chronological.—The chief of these is the *Annales Veteris et Novi Testamenti* (1650-54), a work of vast learning and research, containing a chronology of the whole Scripture. It is from this work that the dates so often printed on the margin of our English version are taken. 4. Miscellaneous, containing writings on ecclesiastical law and polity, &c. U. was a man of vast learning and of great historical acumen. Though he held his opinions firmly and expressed them openly, he was respected by the most opposite parties. Indeed, his doctrines were somewhat eclectic, for though a strong Calvinist he yet held the doctrine of the Real Presence. But the reverence in which he was held was not due to this, but rather to his spotless purity of life and the genuine benevolence of his disposition. See his *Complete Works*, with life by Dr. Elrington, Professor of Divinity in Dublin University (16 vols. 1847).

U'sufruct, a term of Roman law adopted by the law of Scotland. It has essentially the same meaning as *Liferent* (q. v.). In English law, see TENANT FOR LIFE.

U'sury is the taking of more than a legal rate of interest on a loan of money. The Act 17 and 18 Vict. cap. 90 repeals all the Acts against U. See under INTEREST, *Law Regarding Interest of Money*.

U'tah, an organised Territory of the U.S., lies mainly in the great Wahsatch basin, between the Rocky Mountains and the Sierra Nevada, and is bounded N. by Idaho and Wyoming, E. by Colorado, S. by Arizona, and W. by Nevada. Area, 84,000 sq. miles; pop. (1850) 11,380, (1860) 40,273, (1870) 99,581, (1874) 130,000, of whom 115,000 were Mormons, and 13,538 Indians and negroes. U. is 350 miles long from N. to S. by 300 broad, and is traversed from N. to S. by the Wahsatch mountain-range, the E. wall of the Great Basin, which is confined on the W. by a lower range, bearing various local names, as Raft River, Cedar, Goshoot, Wah-Wah, Needle, &c. Beyond this latter range, and in the extreme end of the elevated plateau, much of the surface is alkaline desert, bearing only sagebush or greenwood, except where irrigation has rendered it productive of large crops. The Great Basin has an elevation of from 4250 to 6000 feet, and the Wahsatch attains a total height of 13,000 feet in the snow-clad Nebo and Twin Peaks. To the E. of the Wahsatch lies a plateau, 6000-7000 feet in elevation and some 40 miles wide, sloping towards the upland valley in which San Rafael, Uintah, Dirty Devil, and other rivers rise, forcing their way through cañons varying in depth from 2000 to 5000 feet. These rivers unite in the Rio Colorado of the W., which gives its name to the Great Cañon, a narrow, tortuous chasm, 300 miles long. The drainage of the Great Basin is received by a congeries of large lakes, of which the chief are Great Salt Lake (q. v.) and U. Lake. The former contains 22 per cent. of pure salt, and is therefore destitute of fish, while the latter, with which it is connected by the Jordan, 45 miles long, has pure fresh waters. The Preuss River, flowing into Preuss Lake, and Rio Virgen, a branch of the Colorado, water the S.W. part of the Territory. The formation of the mountains is chiefly Eozoic, of the Great Basin and upper valleys Tertiary, and of East U. Cretaceous, except when the cañons reveal strata reaching down Silurian rocks. U. is rich in precious metals, and in spite of the obstructive policy of the Mormons mining enterprise is rapidly extending. In 1871 no fewer than ninety mining districts were opened, and in 1877 the yield of bullion amounted to $8,113,755. There are larger deposits of iron ore than in any other part of the U.S., the quantity contained in one district of Iron county alone having been estimated at 130 million tons. Castle Valley district, on Green River, is equally rich, and in the N. are other vast deposits. These deposits comprise hæmatite and magnetic ores of fine quality, and both lignite and excellent bituminous coking-coal exist in their vicinity, as well as fluxes and other requisites for smelting. The lignites of the Great Basin are valuable for fuel, but do not coke; the cañons of Green and Grand Rivers contain bituminous coal in thick workable seams. Copper and zinc abound in U., which also produces much salt, sulphur, carbonate of soda, alum, borax, &c. Salt is largely procured by evaporation from the lakes, but rock-salt is also present in vast quantities. The mean temperature ranges from 48·65° in the S. to 51·51° in the N.; at Coalville it is 69·2° in summer and 21·9° in winter, and at Salt Lake City, 75·9° in summer and 32·1° in winter. The Great Basin is almost rainless, but in East U. the yearly fall is 15·10 inches. The animals are those peculiar to the Rocky Mountains (q. v.); the sage, hare, and 'Baird's rabbit,' are notable. The hills are wooded nearly to the snow-line, but there are in all only 4000 sq. miles of timber. The trees of the Basin resemble those of the Pacific slope, but do not attain the greatest dimensions. The Mormon system of irrigation is singularly effective, and, in 1874, 250,000 acres were under crops. The yield in 1874 comprised 2,000,000 bushels of wheat, 350,000 of barley, 700,000 of oats, 375,000 of Indian corn, 2,000,000 of potatoes, 300,000 tons of hay, and a valuable crop of fine fruit—total value, $6,000,000. In 1870 U. had 14,281 horses, 2879 mules and asses, 190,934 neat cattle, 59,672 sheep, and 3150 swine—value $2,149,814. The industrial products are iron and iron goods, flour, lumber, and woollen goods. In 1875 U. contained 596 miles of railway (Union-Pacific and branch, S. by Salt Lake to Provo), besides 350 irrigating canals, constructed at a cost of $2,225,000. Salt Lake City (q. v.) is the capital, and other towns are Ogden, Provo, Lehi, Mount Pleasant, and Iron City. U., named from the Utes, a tribe of Indians, was ceded by Mexico in 1848, in which year it was settled by the Mormons (q. v.). It was organised as a Territory in 1850, but the demand of the Mormons for its admission as the 'State of Deseret' was refused in 1862. The legislature is still wholly composed of Mormons, and at various times it has come into collision with the U.S. Congress on the subjects of supreme authority and the recognition extended to polygamy. An investigation into the shocking massacre of settlers by Indians, which occurred in Santa Clara (1857), was begun by the Government in 1875, some fresh revelations pointing to Mormon instigation.

U'terus. See WOMB.

U'tica, a Tyrian colony founded about 1100 B.C. on the N. coast of Zeugitana in Africa, near the mouth of the Bagradas (*Mejerdah*), and 27 miles N.W. of Carthage. It figures as the latter's ally or dependant in treaties from 509 to 215 B.C., but, having aided it in the two first Punic Wars, seceded in the third (149-46 B.C.), and thenceforth was the chief town of the province and a great emporium of Roman commerce. Created a *civitas* by Augustus and *colonia* by Hadrian, it received from Septimus Severus the *jus Italicum*, was the see of a Christian bishop (256-684 A.D.), and was finally destroyed by the Saracens. At the modern *Duar* are the remains of its amphitheatre (seating 20,000 spectators), of an aqueduct, and of numerous temples.

U'tica, the capital of Oneida county, New York, on the S. bank of the Mohawk river, 96 miles W. of Albany by rail. It is situated on the Erie Canal, is the terminus of the Chenango Canal, and immediately to the S. are rich deposits of iron ores, which are now wrought on an extensive scale. Lying in a productive dairy-farming district, it is the chief market for cheese in the United States, having sold 200,000 boxes, or $1,735,592 worth, in 1875. The industrial products are woollens, cottons, ready-made clothing, boots and shoes (630,000 pairs yearly), steam-engines, stones, lamps, farm-implements, millstones, and drain-tiles. There are three fine parks within the town, and an excellent driving park on its eastern boundary, while the water-works have a capacity of 400,000,000 gallons annually. In 1878 U. had 32 churches, at four of which the service was in Welsh and at six in German. The periodicals number two daily and three English weekly, a German tri-weekly, a Welsh weekly, and two Welsh monthlies. Pop. in 1870, 28,804; in 1875, 32,070. U. was settled in 1787 and incorporated in 1798.

Utilita'rianism is that theory of life which represents happiness as the only ultimate end to be desired and sought after—not necessarily the happiness of the individual, but that of the human race as a totality, and 'even as far as possible of the sentient creation'—in Bentham's phrase, 'the greatest happiness of the greatest number.' The theory as one of moral action asserts—'Actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness' (Mill's *U.*). Like all other systems, U. is best looked at from the point of view of its historical development. We find its first statement as a philosophical theory among the Greeks. It is presupposed in the philosophy of Socrates (q. v.), or rather it unconsciously underlies that philosophy; but to claim Socrates as an adherent of U. is to apply modern conceptions to ancient ideas, and the result is only misleading. The same remark applies to Aristotle (q. v.), who asserted that the absolute end

(*telos*) of human action is happiness; since the statement is almost meaningless, unless taken in accordance with the whole teaching of his philosophy. In Epicurus (q. v.) we recognise a true adherent of U. He 'sought the *summum bonum* in felicity of life;' not, indeed, in any low sense, since he held that pleasure was a certain fair even satisfaction and calm, extending over the whole life, and did not consist of moments of ecstatic joy. Still, all happiness is thus reduced to a strictly individual system, and the gaps in this as well as in the opposite (Stoic) system are strikingly represented in the paradox, common to both, of the wise man happy on the rack. Thus U., as far as it was capable of development as an individual system, received that development in Greece. For its further development we must refer to the last three hundred years of English thought.

Hobbes (q. v.) enunciated with startling plainness a system of individual selfishness. 'Whatsoever is the object of any man's appetite or desire, that is it which he for his part calleth good, and the object of his hate and aversion evil; and of his contempt rude and inconsiderable.' Each man, continues Hobbes, must settle for himself what is right and wrong according to his individual pleasure; or if there be a collision of interests, he must concur in the appointment of some arbiter (the State) who shall settle what is right and wrong for him. With Paley (q. v.) U. took a theological aspect. Virtue he defined to be 'the doing good to mankind, in obedience to the will of God, and for the sake of everlasting happiness.' This particular development of U. is deserving of more attention than it usually receives, Paley only consciously stated what the great majority of his countrymen unconsciously believed, for this practical definite form is exactly in accordance with the English mind. As a proof of this it may be noted that men so widely removed from Paley and from each other as Berkeley (q. v.) and Butler (q. v.), assume without a doubt a moral system analogous to this. With Jeremy Bentham (q. v.), the inventor of the term the 'greatest happiness of the greatest number,' as the end of all true moral action, U. takes its more modern shape. 'Nature,' he said, 'has placed mankind under the government of two sovereign masters, Pain and Pleasure. It is for them alone to point out what we ought to do.' In J. S. Mill (q. v.) U. assumes its present, which may be safely said to be its highest, form. There, the happiness of the race is announced as an end to be pursued by the individual, even though he should be obliged to renounce his own in its attainment. A place is found for the martyr's effort, but that effort must be in accordance with the great principle of U., or it is worse than useless. Moreover, happiness is here no low or degrading conception, for there is *quality* as well as *quantity* in pleasures, and a lower pleasure must yield to a higher—the senses to the intellect, the body to the mind. Those who have had experience of both may be taken as judges of the question. They have uniformly given the palm to the higher pleasures, and from their decision 'I apprehend there can be no appeal.' By careful moral education the conscience of the individual is to be so developed that its force in the direction of right action will be all-powerful.

That U. is a theory of great plausibility, and that it can urge a great deal in support of its position, is evident from the preceding historical sketch. It is, so to speak, a self-contained theory; it does not require to go beyond the obvious facts of existence to support its claims; it is plain, simple, and direct; it affords an easy and safe rule for the solution of all disputed questions of morals; and it is in obvious agreement with a vast number of the most patent facts of life. Many arguments have been employed against U. It has been urged (1) that our powers have various ends, how then can happiness be the end of them all? (2) that all actions producing happiness are not regarded as moral actions. All actions producing pain are not wrong actions; (3) that pain may be used as a means to good, but we must not do evil that good may come of it; (4) that we cannot always calculate beforehand whether the effects of an action will be good or bad. Human life is too complex, and the knowledge an individual has of it is too small to allow him to judge with perfect certainty. Besides, men will take different views of such questions, and thus the moral standard will at best be but a fluctuating one. These objections have been more or less effectively met by the advocates of U., but the gravest objection to the doctrine is (5) that it has no proper theory of duty—the word 'right' has no deep true meaning in this system. This will appear from a little reflection. If my interest conflicts with that of the race, if it urges me to do an immoral act, shall I not simply show strength of intellect and a wise perception of my own individual position if I disregard anything but my own interest? My conscience, it is true, tells me not; but what is this conscience? According to Professor Bain's analysis, it is a triple compound placed in me by education, and composed (1) of fear, since the child finds its wrong-doing punished; (2) of respect, since the child respects those who are older and wiser, and who instruct and guide; (3) of utility, since the child finds when it grows up that the prohibitions and commands laid upon it in infancy had a deep and wise meaning. Mill, by an analysis substantially similar, says that a feeling, a pain more or less intense on the violation of duty, is of the essence of conscience, and that this feeling implanted by education is one of sympathy and fellow-feeling with the race. Now, all this is true no doubt, but still it hardly covers the difficulty. Conscience may consist of any combination of feelings, however powerful and sacred, but will not their disregard on convenient occasions be simply an exhibition of rational strength? This, then, is a weak spot in U., a joint in the harness, and unfortunately just over the heart of the system. The best answer that can be attempted seems the following:—On a utilitarian theory it must be admitted that there is no such thing as absolute good or evil, or absolute moral duty. But humanity has created a morality for itself, and he who departs from it is a wrong-doer, inasmuch as he sins against the race. This relative right- and wrong-doing is all that the circumstances of the case admit. It is to be noted that in the later utterances of U. the religious element is only introduced in a side manner. Of course, in a theory like this, all the difficulty as to a motive force is got over when we adopt a system like Paley's; on any other system, the answer must be as given above. It is to be carefully noted that even if we reject U. we are not forced to adopt the contrary system of Intuitionalism. The systems are contrary, and not contradictory; they may both be false, though both cannot be true. See J. S. Mill, *U.* (new ed. Lond. 1871): J. Grote, *An Examination of the Utilitarian Philosophy* (edited by J. B. Mayor, Lond. 1870); Birks, *Modern U.* (Lond. 1874); Sidgwick's *Methods of Ethics* (Lond. 1874); and Calderwood's *Handbook of Moral Philosophy* (5th ed. Lond. 1878).

Uto'pia (Gr. 'nowhere') is the name given by Sir Thomas More (q. v.) to the island which is the seat of his ideal commonwealth, whose merits put to shame the imperfections of European states. From it we derive the adjective 'Utopian,' applied to any scheme or idea which is, or is supposed to be, impracticable. The word is often rashly used. Every reform in religion, government, or society has had to pass through a 'Utopian' phase.

U'traquists. See CALIXTINES.

Utrecht', a province of Holland lying S. of the Zuider Zee, and bounded E. by Gelderland, S. by South Holland, and W. by North Holland. Area, 532 sq. miles; pop. (1877) 188,522 (three-eighths Protestant, two-fifths Roman Catholic). The surface is in general flat, and somewhat marshy in the W.; in the E. is the low range of Amersfoort. The chief streams are the Rhine, with its arms, the Krummen or Old Rhine, Vecht, Yssel, Leck, and the Gem, which falls at Bunschooten into the Zuider Zee. Many canals intersect the province, most important of which is the Baart, connecting the Leck with the Vecht. The chief productions are corn, tobacco, and honey. Cattle and horses are exported. There are manufactures of woollens, cottons, linens, silks, tobacco, and clay wares.—**U.**, capital of the preceding, and one of the oldest towns in Holland, on the Old Rhine, two arms of which intersect the town, and which is connected by the Vecht with the Zuider Zee and by the Baart with the Leck, 23 miles S.S.E. of Amsterdam by rail. It is surrounded with strong forts, around which are beautiful promenades; it has four suburbs, and in its E. quarter is the Maliebaan, a fine six-rowed avenue of lindens., with handsome villas on each side. It has twenty churches, including the Gothic cathedral Maartenskerke, the nave of which was thrown down by a hurricane in 1674, so that now the choir and the tower stand separate. The tower is 321 feet high, and has a chime of forty-two bells. Among the other buildings are the Academy, in the great hall of which the union of the northern provinces was concluded in 1579; the palace of Louis Buonaparte, king of Holland, who chose U. for his residence, now the seat of the supreme military court; the Paushuizen, or Pope's

house, built by Pope Adrian VI., who was born at U. in 1459; the Palace of Justice, erected in 1837 on the site of the celebrated abbey of St. Paul; and the Stadhuis, built in 1830, with a rich collection of national archives and antiquities. The University was founded in 1634, and had, in 1871, 23 professors and 481 students. It has a library of 50,000 vols., a botanical garden, an astronomical and a meteorological observatory, a natural history museum, a chemical and a physical laboratory. U. has a gymnasium, a veterinary and a technical school, a picture-gallery, a theatre, and a hospital. Its industries are metal-founding, tile-burning, dyeing, linen and silk weaving, and the manufacture of woollens, cottons, porcelain, chemicals, machinery, and agricultural implements. T. has also an active trade in agricultural produce, especially cheese and butter. Pop. (1876) 65,052. U. was the *Trajectum ad Rhenum* of the Romans. It was given in 696 to Bishop Willibrod by Karl Martel, and was made in 1559 the metropolitan church by Pope Paul IV. Under the rule of Philip II. of Spain was concluded at U. the union of the Seven United Provinces, which was the foundation of the independence of the Netherlands. At U. was concluded, April 15, 1713, the treaty which brought to a close the war of the Spanish Succession. See SUCCESSION, WARS OF.

Utre'ra (*Verculum*), a town of Spain, province of Seville, 18 miles by railway S.E. of the city of Seville, was at one time a place of some celebrity, but is now much decayed, though still important as a military post. It contains a fine Gothic church, a Moorish palace, and cavalry barracks. In the environs olives are grown largely. Pop. 12,900.

Utt'ering, in law, signifies the making use of a forged writing (see FORGERY), or the passing, or attempting to pass, a base coin as a true one. Forgery is not completed without the U. It is criminal to utter false foreign coin.

Uttox'eter, a town of Staffordshire, England, near the Dove, 16 miles E.N.E. of Stafford by rail. The parish church still possesses an ancient tower and spire, but it was rebuilt in 1828, and its chancel was extended in 1877. Other buildings are the town-hall (1855), mechanics' institute, and free grammar-school (1859). The Caldon Canal ends here. Breweries afford employment to many hands. Pop. (1871) 3604.

U'vula. See PALATE.

Uva-Ursi. See ARCTOSTAPHYLOS.

Ux'bridge, a town of Middlesex, England, on the Colne, 15¾ miles W. of London by rail. The ancient church of St. Margaret was restored in 1872 by Sir G. G. Scott, who also designed St. Andrew's (1865), with a spire of 170 feet; and a spacious Corn Exchange was erected in 1861. A large weekly corn-market is held here. Pop. (1871) 7407.

Uz'beks, the dominant race of Turkestán, of purely Turkish descent, constitute the military and governing class in Khiva, Bokhára, and Khokan, and by Meyendorff were estimated at 1,500,000 souls. Partly nomad and partly sedentary, the U. are distributed by Vámbéry into thirty-two tribes, of which the chief are the Ming (to which the kháns of Khokan belong), the Chagátáis of Namaghán, the agricultural Kuiúmas on the river Sír, and the Kipchaks, almost extirpated in 1853, up to which date they had stood at the head of the race. The U. have less of a Tartar aspect than the Kirghiz, but in Bokhára are much infused with Tagik blood. Brave soldiers, they are to a man fanatical Mohammedans. In history they first emerge shortly after the death of Timur (1405), and now, after holding the predominance for over three centuries, they have for the most part passed to Russia by its annexations of Bokhára, Khiva, and Khokan (1866-75). See TURKESTAN, and Von Hellwald's *Russians in Central Asia* (Eng. trans. Lond. 1874).

V.



the twenty-second letter of the English alphabet, occupying the same place as in Latin. Its form is derived from the Greek υ or Υ; but its phonetic value is rather identical with that of the Semitic Vau and the archaic Greek digamma, which is also represented by F (q. v.). It bears the same relation to U as the consonant J does to the vowel I, and in both cases the form of these pairs was originally identical. In German it is pronounced soft, like our F; and probably this is its proper phonetic value. In Latin it has a tendency to disappear by elision; *e.g.*, *non volo*=*nolo*, and *providens*=*prudens*. Its commonest interchanges are with U, F, and B. *Cf.* 'solve' and 'solution;' *navita* and *nauta*; Lat. *cervus*=Fr. *cerf*; Lat. *vervex*=Fr. *brebis*. The numerous instances in which a Latin V represents a lost Greek digamma, such as *vinum* for *oinos*, *videre* for *idein*, are really examples of the interchange between V and F. In Greek, V is transliterated by *ου* or by *β*.

As a numeral, V stands for five, being supposed to represent the outstretched fingers of one hand. As an abbreviation, V. in English stands for Victoria, as V.R. = Victoria Regina, V.C. = Victoria Cross.

Vaal, an important river of S. Africa, rises in the Quathlamba (q. v.) Mountains, and after an extremely tortuous course of fully 500 miles unites with the Orange River in 29° 10′ S. lat., 24° 28′ E. long. Its Dutch name of V., and its Hottentot designation of Ky Gariep, both have reference to its yellow colour when in flood. By the Bechuans the V. is called the Namagare or Likwa.

Vaca'tion, in English law, is the time between the end of one term and the beginning of another, which commences the last day of every term as soon as the court rises. There is also a V. in the *spiritualities*, from the death of the bishop or other spiritual person until the appointment of another. The word is also used to denote school-holidays.

Vaccina'tion (from Lat. *vacca*, 'a cow') is the process by which the *materies morbi* of a specific disease, termed *vaccinia*, is introduced into the human organism with the view of protecting the individual against an attack of smallpox. The protective power afforded by V. was discovered by Dr. Jenner, who made his first experiment in 1792, and published his results in 1798. The real date of the introduction of V. into England may be said to be 1796. The results were extraordinary. In the ten years ending 1799, the deaths from small-pox in London were 22,863 to the million; in the ten years ending 1819 they were 8045 to the million; and in the ten years ending 1849 they were only 4798; so that V. may fairly claim to have reduced the mortality from about 23,000 to 5000 in fifty years. Jenner, in his *Inquiry into the Cause and Effects of the Variolæ Vaccinæ*, published in 1798, shows (1) that cow-pox casually communicated to man has the power of rendering him unsusceptible of small-pox; (2) that the specific cow-pox alone, and not other eruptions affecting the cow, which might be confounded with it, has this protective power; (3) that the cow-pox might be communicated at will from the cow to man by the hand of the surgeon, whenever the requisite opportunity existed; and (4) that the cow-pox, once ingrafted on the human subject, might be continued from individual to individual by successive transmissions, conferring on each the same immunity from small-pox as was enjoyed by the one first infected direct from the cow.

The vaccine virus is a colourless, somewhat viscid fluid, consisting mainly of the bioplasm of Beale. On microscopic examination, no definite forms can be detected, but a multitude of minute molecules may be seen. This vaccine is simply the infectious matter of small-pox modified by passing through the body of the cow. The identity of cow-pox and small-pox is certain. Vaccine was originally taken from the cow, but is now taken from the human subject, an uninterrupted series of pocks having been kept up and transmitted by vaccinators. Recently, however, cattle have been inoculated with small-pox, and matter from the resulting cow-pox pustule has been used for V. purposes.

The Operation of V. is performed as follows:—A small quantity, a drop or two, of the vaccine lymph is taken upon the point of a lancet or other instrument, and inserted in four or more points in the skin. On the day of the operation there is usually a little redness around the punctures or scratches; but this soon disappears, and the skin assumes its natural appearance. On the third or fourth day the skin at the spot becomes slightly elevated, hard, and red; on the fifth or sixth day a vesicle of a bluish-white colour, with an elevated edge and a depressed cup, forms; on the eighth day the vesicle reaches its maturity, and is distended with clear lymph; on the ninth day the vesicle is surrounded with an inflamed ring or areola; on the ninth, tenth, and eleventh days the vesicle becomes a pustule, the cupped form disappears, and the areola enlarges till it becomes a circle, with a diameter of from 1 to 3 inches; on the twelfth, thirteenth, and fourteenth days, the pustule dries up; and in the course of the following week the scab separates and falls off. On the appearance of the areola there is usually slight constitutional disturbance, and occasionally swelling of the glands in the armpits; but these symptoms are not often severe, and as a general rule no treatment is required. It is quite immaterial on what part of the body V. is performed, but the usual part selected is on the arm at the insertion of the deltoid muscle. After the separation of the scab, and the healing up of the sore, a cicatrix is left which is permanent in after life. The cicatrix is dotted or indented with minute pits, and is sometimes radiated.

As a general rule children should only be vaccinated when they are in apparently good health, unless when small-pox may be in the neighbourhood. Dr. Seaton, the medical officer of the Local Government Board, says—'Plump and healthy children living in large towns should be vaccinated when a month or six weeks old; in more delicate children the V. might be postponed till they are two or three months old; but all, except those whose state of health positively contra-indicates V., should be vaccinated by the age of three months.'

The lymph used should always be taken from a healthy child, and from thoroughly characteristic vesicles. Dr. Jenner recommended that lymph for V. purposes should be taken from the human subject on the sixth day, the day on which the lymph is most active, though less plentiful. Dr. Seaton says—'Prime lymph has always a certain degree of viscidity; and a thin serous lymph, even from a vesicle which is not advanced, is to be avoided. Babies are much better lymph-givers than older children or adults; and children of dark complexion, not too florid, with a thick, smooth, clear skin, yield the finest and most effective lymph.' V. should always, when practicable, be performed from arm to arm, and preserved lymph should only be used when a vaccinated child cannot be obtained. A good vesicle exudes lymph sufficient for the V. of five or six children.

The extent to which the V. Act is carried out in England and Wales may be gathered from Dr. Seaton's Report to the Local Government Board, 1878. 'Of 850,354 births returned to the Board by the several V. officers in England and Wales, as registered during the year 1875, the number which at the time the return was made had been registered as successfully vaccinated was 722,466 (being 84·9 per cent. of the whole), and the number

registered as having died before they could be vaccinated was 86,673 (or 10·2 per cent. of the whole. Of the remaining 41,215 children, 838 (or 0·09 per cent. of the whole) had been registered as insusceptible of successful V. Of these probably not one was really insusceptible. The cases included under this heading are children who, being certified as having been three times unsuccessfully vaccinated, are no longer subject to the compulsory provisions of the law, 38 (or 0·004 per cent.) had contracted small-pox before they could be vaccinated; 5914 (or 0·69 per cent.) as having their V. postponed by medical certificate, leaving 34,425 (or 4·04 per cent.) as 'removed,' 'not to be traced,' or otherwise unaccounted for. If from the 850,354 births deduction of the deaths without V. be first made, it appears that of the surviving 763,681 children there were registered at the time of the return 94·6 per cent. as successfully vaccinated; 0·11 per cent. as either insusceptible of V., or as having had small-pox; and 0·77 per cent. as under medical certificate of postponement, leaving 4·5 per cent. as at that time still to account for.' From the last returns of the Registrar-General for Scotland, 1874, we learn that 87·213 per cent. were successfully vaccinated; that 0·992 per cent. were postponed; that 0·166 were insusceptible constitutionally; 0·027 from having had small-pox; 0·165 from previous V.; 9·114 died before V.; and 2·323 had removed from the district and could not be traced.

Dr. Jenner supposed that by V. the individual would be infallibly protected against an attack of small-pox during his life, and that by V. alone small-pox would be entirely eradicated; but it has been established beyond a doubt that V. does not adequately protect the individual more than a certain number of years. Re-vaccination is a physiological test by which it may be ascertained whether the individual is liable or not to be attacked with small-pox. If the person is unsusceptible or protected by primary V., re-vaccination will be abortive, or will only produce an irritant effect; but if he is susceptible, the vaccine pock will run its natural course. The exact length of time during which a person is protected by V. probably varies; but every individual should be re-vaccinated at the age of sixteen. Dr. Heim of the Wurtemberg army has collected statistics relative to 40,000 revaccinations. The subjects were young recruits from twenty to twenty-one years of age, who had all been vaccinated in infancy. Of these one-half were successfully re-vaccinated, the vesicles running their normal course; so that these 20,000, although previously vaccinated, were susceptible to small-pox. After the Wurtemberg Government made revaccination compulsory there was a marked decrease of small-pox in the army; thus in 1824 there were 619 cases; in 1835, 250; in 1836, 159; and in 1837, 94. In 1858 an order was issued in Great Britain by which every recruit on joining his regiment was to be revaccinated, and this regulation still continues in force.

Law Regarding V.—The principal Act now in force regarding V. is the 30th and 31st Vict. c. 84, which contains the penalties for the breach of its enactments, and provides (sec. 33) for the costs of prosecutions, while sec. 38 provides for the expenses incurred in certain other proceedings in respect of V. The Act has been amended by 34 and 35 Vict. c. 98. In England the V. of all children three months of age and under is compulsory; but in Scotland the age is six months and under.

Vaccinia'ceæ, a sub-order of *Ericaceæ*, differing from *Ericeæ* in having epigynous stamens and an inferior ovary. *Vaccinium* and *Oxycoccos* are the best-known genera (see WHORTLEBERRY and CRANBERRY). About 15 genera range under V., consisting of much-branched shrubs or small trees, with simple, often evergreen leaves, and frequently richly-coloured flowers. They are fairly represented as garden plants.

Vac'uum (Lat. 'empty'), in physics, denotes a portion of space void of matter. The possibility of the existence of a perfect V. has been a favourite subject of discussion among metaphysicians; and that the negative view was popular is indicated by the historical phrase 'the vacuum which nature abhors.' Descartes asserted that if the contents of a hollow vessel were taken out without anything entering to fill its place, the sides of the vessel would be in contact. This assertion, however, is based upon the dogma that the only essential property of matter was its extension; that, in other words, matter was indistinguishable from space. Such inquiries, however, can lead to nothing definite. The experimental philosopher is obliged to recognise the practical impossibility of obtaining a perfect V. The so-called Torricellian V., which exists above the mercury column of a barometer, is really filled with mercury vapour probably mixed with a small percentage of air. The very action by means of which the air-pump produces its V. shows that there can never be an absolute void—a little air always remaining behind. Andrews, following up a suggestion of Davy, has obtained remarkable vacua by first pumping in carbonic acid so as to expel as far as possible the air, and then after ordinary exhaustion leaving the carbonic acid to be taken up by moistened caustic potash which has been previously placed in the receiver. In this way Andrews has removed all but $\frac{1}{350.000}$th of the gas originally present, whereas by ordinary air-pump action only $\frac{1}{120}$th of the gas can be removed. Frankland, Gassiot, Crookes, Dewar, and others, have devised various improvements. Dewar takes advantage of the property of gases to condense on the surface of solids in a remarkably ingenious way. A piece of carbon, placed in the V. vessel, is kept heated while the vessel is being exhausted. After the exhaustion is completed as far as possible, the carbon is allowed to cool so as to permit the small quantity of gas present to condense in its pores. A gentle heating of the carbon at once releases a quantity of the gas, so that this method is invaluable in the study of electric discharges through rarefied gases, since the rarefaction can be so easily altered at will.

Va'grancy. See BEGGAR, and POOR and POOR LAWS.

Vagi'na, the membranous canal leading from the *uterus* or Womb (q. v.) to the external genitalia. The V. in lower mammals, such as the *Ornithorhynchus*, opens into a *cloaca* (see ORNITHODELPHIA), while in the kangaroos and other *Marsupialia* (q. v.) it opens into a canal named the *uro-genital canal*, which receives the efferent ducts of the urinary organs. In higher quadrupeds the V. is distinct both from the *rectum* and the urinary ducts. In the human subject it attains a length of about 4 inches measured along its anterior wall and 6 inches measured on its posterior surface. It lies between the bladder and rectum; constricted at its commencement it becomes dilated towards its uterine end. The coats of the V. number three—an external or muscular layer, a layer of erectile tissue, and an inner or mucous layer. The mucous layer is thrown into folds or *rugæ*, which permit the distension of the canal in the process of *parturition*.

Vaigatch', an island in the Arctic Ocean, 67 miles long by 26 miles broad, belonging to the Russian government of Archangel, separated by the V. or Yugor Strait from the Continent, and by the Kara Strait from Novaia Zemlia. Its northmost point is under lat. 70° 29' W. V. is mountainous, especially in the middle. The vegetation is very poor; only on the southern declivities of the mountains are found the sorrel, wild onion, spoonwort, and forget-me-not. V. is rich in furred animals (red and blue foxes, reindeer, polar bears, and wolves), sea-birds, and sea-animals; and in summer the few Samoyedes who live permanently on V. are visited by bands of Russian, Syryane, and Samoyede hunters.

Vaillant, Jean-Baptiste, Philibert, Comte, a French marshal, was born at Dijon, December 6, 1790, and after studying at the École polytechnique entered the army in 1809 as sub-lieutenant of engineers. He accompanied the grand army in the Russian expedition, and had the misfortune to be taken prisoner. From 1826 to 1830 he served as chief of a battalion in Algiers, and in 1832 he distinguished himself at the siege of Antwerp. In 1837 he returned to Algiers to superintend the fortifications, and in 1840 the reconstruction of the fortifications of Paris was entrusted to him along with Marshal Dode de la Brunerie. His last important achievement was the siege of Rome in 1849, which led to his receiving the marshal's baton in 1851. In 1854 he was War Minister. V. died at Paris, June 4, 1872.

Vaish'nav or **Boish'tob**, the name of that Hindu sect which pays especial worship to Vishnu (q. v.) above the other two members of the trinity. No less than six historical subdivisions are enumerated, founded by successive religious reformers, in protest against the corruptions of Brahminism. The chief places of pilgrimage are Juggernauth, Brindabun, Benares, and Seringam. The sect generally may be divided into two divisions —the devotees, who are either *gosains* or *gurus*, of whom many

live in convents and profess celibacy; and the lay members, who largely belong to the well-to-do and trading classes. The general census, 1868-1872, returns only 540,000 Vaishnavs throughout all India, chiefly in Lower Bengal; but this only includes the Byragees or ascetics, and presumably not all even of them. The Madras Census Report of 1871 states that 11,657,000 persons in that Presidency, or 40 per cent. of the total Hindu population, chiefly in the N.E., are Vaishnavs. See *Sketch of the Religious Sects of the Hindus*, by H. H. Wilson (Works, vol. i. Lond. 1862).

Val'ais (Ger. *Wallis*), the third in size of the Swiss Cantons, is bounded N. by Lake Geneva, Vaud, and Bern, E. by Uri and Ticino, S. by Italy, and W. by France. Area, 2025 sq. miles; pop. (1877) 101,131, nearly all Catholics. Forming the valley of the Upper Rhone from its source to its entrance into Lake Geneva, and enclosed by the Bernese and the Pennine Alps (q. v.), V. is mainly devoted to the rearing of cattle, sheep, and goats, only a fourth of the surface being arable. Cheese-making, bee-keeping, and the cultivation of the vine, are also sources of considerable wealth. V. is one of the two mining cantons, yielding iron, lead, cobalt, nickel, sulphur, and anthracite; but its manufactures (silk, cloth, glass, &c.) are unimportant. Of Celtic origin, the inhabitants of V. were reduced by Cæsar to the sway of Rome, and were under Burgundians, Franks, and others for several centuries. In 1032 the territory of V. became an imperial fief, and as such was held by the Dukes of Zähringen, whose cruelty led to an insurrection (1184-1211). In 1477 V. formed an alliance with Bern, and in 1597 entered the Swiss Confederacy. See Furrer's *Geschichte von Wallis* (1874).

Valck'naer, Ludwig Kaspar, a Dutch philologist, was born at Leeuwarden in Friesland, 7th June 1715. In 1741 he succeeded the famous Hemsterhuis in the Greek chair at Franeker, and in 1766 was called to Leyden, where he died 15th March 1785. During his lifetime he published *De Ritibus in Jurando* (Franek. 1735), and edited Theocritus and some of the plays of Euripides; and after his death his *Observationes Academicæ* were brought out by Scheidius (Utrecht 1790), his edition of *Callimachi Fragmenta* by his son-in-law Luzac (Leyden 1799), and two volumes of *Opuscula* by Erfurdt (Leip. 1808). His letters to Ernesti were edited, along with those of Ruhnken by Tittmann (Leip. 1802), and his erudite treatise *De Aristobulo Judæo* appeared in 1806. V. was an admirable scholar. To an exact and critical knowledge of the classical languages he added an equally critical knowledge of the antiquities of Greece and Rome. No man worked harder or to better purpose in the cause of humanistic learning. See Bergmann, *Memoria L. C. Valckenarii* (Utrecht 1874).

Valdai' Hills or **Volshon'ski Forest**, the highest elevation in the interior of W. Russia, forming the watershed between the Volga and the feeders of Lake Ilmen, and containing the sources of the Volga, the Dnieper, and the Düna, lie on the borders of the governments of Novgorod and Tver. They consist of wooded ranges averaging 295 feet in height, though rising in Popova Gora to 1080 feet, rich in sandstone, lime, and black and red clay.

Valdepe'ñas, a town of Spain, province of Ciudad Real, 32 miles S.E. of the city of Ciudad Real. Its celebrity depends wholly on the red wine of V., which is highly esteemed by connoisseurs, but can seldom be obtained pure out of Spain. Pop. (1860) 7400.

Valdiv'ia, a town in the S. of Chili, capital of a province of the same name, on the river V., 9 miles from its mouth, with a safe and roomy harbour. The entrance to the river is fortified. The town is built on level ground, and is embosomed in apple orchards, surrounded by the native forest. It has an active coasting trade, chiefly with Valparaiso. V. was founded in 1551 by Pedro de V., one of Pizarro's lieutenants, who named it after himself, and it was at one time a place of great wealth. At the census of 1875, however, the pop. was only 3872. The *province* of V. has an area of 10,715 sq. miles, with a pop. in 1877 of 31,826. Besides splendid forests it has large upland pastures, and deposits of coal are known to exist within it.

Valence', capital of the department of Drôme, France, on the left bank of the Rhone, 65 miles S. of Lyon by rail. It is an old walled city divided into a high and low town. It has an ancient citadel, and a cathedral of Saint Apollinaire, in the pure Romanesque style, dates in its present form from the 11th c. The Protestant Collegiate church of St. Ruf and several others are of architectural interest. On a steep hill opposite the town stand the picturesque ruins of the castle of Creussol. V. has a good museum, a public library, a botanic garden, and an artillery school, where Napoleon studied 1785–91. There are a few Roman remains in the neighbourhood, especially at a little place called Die. Silk, olive-oil, leather, glass, gloves, cotton goods, wines, and spirits are manufactured and exported in considerable quantity. Pop. (1876) 23,220. Some say V. was founded by the emperor Valens; others identify it with *Valentia Segovellanorum*, a military station in Cæsar's time. The Protestant party were strong here at the time of the Reformation, and fierce struggles took place between them and the Catholics.

Valen'cia, a town of Venezuela, situated in a very rich district two miles W. of a lake of the same name, and 30 miles S. of Puerto Cabello (q. v.), with which it has a brisk trade. Large numbers of cattle, horses, and mules are reared in the neighbourhood. Pop. (1875) 28,594. The lake of V. measures about 54 miles by 14, but is decreasing in size, though it receives a number of large streams and has no outlet. A great many fertile islands stud its surface.

Valen'cia, a former kingdom of Spain (now forming the three provinces of V., Alicante, and Castellon de la Plana) which was bounded N. by Aragon, N.E. by Catalonia, W. by Murcia, New Castile, and Aragon, and E. and S.E. by the Mediterranean Sea. Area 8897 sq. miles; pop. (1871) 1,393,660. The surface is in great part mountainous, and is abundantly watered by the Guadalaviar (Turia), which crosses it from N.W. to S.E., the Mijares, the Jucar, and the Segura. The soil is exceptionally fertile, and is capable of yielding from three to five crops of various fruits, while the climate is mild and healthy: the heat is tempered by the sea-breezes, and the skies are almost always clear and blue. Hemp, flax, wheat, barley, maize, rice, figs, and almonds are extensively grown, and oranges, raisins, and wine are largely exported. The mineral wealth consists of coal, iron, copper, lead, cinnabar, cobalt, and salt; while the industries are silk, linen, and woollen spinning and weaving, paper-making, and the plaiting of esparto grass. The inhabitants still show unmistakable evidence of their Moorish origin.—**V.**, capital of the preceding, and one of the finest and busiest cities of Spain, stands in a fertile Huerta, on the left bank of the Guadalaviar or Turia, 2½ miles from Villa Grao at its mouth, 170¾ miles S.E. of Tarragona by rail. It is surrounded with old walls and ramparts with four towers, has three suburbs, many promenades—the finest the Glorieta—and five fine bridges over the river. Its streets are narrow and crooked, most of them unpaved, and it has many old public and private buildings in the Moorish style of architecture. It has 17 chapels, 13 convents, 14 former monasteries, and 14 churches, of which the principal are the chapel De Los Desamparados, the churches San Juan, San Martin, San Andros, San Esteban, and the famous Cathedral, an irregular but imposing building with an octagonal Moorish steeple, El Miguelete, 130 feet high. Other buildings are the palace of the viceroy; the Lonja, in the Moorish-Gothic style, with an imposing piazza, a great mart for raw silk; the Casa Consistoriates or Town-hall; the Serrano Gate; and the Gothic Longa de Seda. V. is the seat of the Governor of V. and Murcia and of an archbishop, and has a theatre, an academy of fine art, a picture-gallery (*museo*) containing fine examples of Juanez, a house of correction (*presidio modelo*), a university (founded 1410) with a library of 56,000 vols. and the best botanic garden in Spain. The principal industry of V. is silk spinning and weaving; it has, however, large manufactures of azulejo porcelain, and of tobacco, the royal factory alone giving employment to 3200 women and 250 men. It is the seat of an extensive trade in oranges and wine. In 1873 there entered and cleared the port 3879 vessels of 629,680 tons, and the total imports amounted to £1,420,000, the exports to £876,000; while in 1877, in 68 British vessels the importations amounted to £196,122, and consisted of 30,878 cwts. of codfish, 24,875 tons of coal and patent fuel, 105 tons of oil, 1013 tons of iron, 805 tons of rails, 30 tons of machinery, 35,674 sleepers, and 12,100 tons of Peruvian guano, the value of the last article alone being estimated at £145,000. In the same year the exports

in British vessels amounted to £473,450, and consisted of onions, oil, saffron, silk, staves, melons, raisins, minerals, wine, and oranges, the last alone computed at £420,000. Pop. (1877) 153,500. V. was destroyed by Pompey and rebuilt by Sertorius, and fell at the end of the 5th c. to the West Goths, and in 715 to the Moors. In 1094 it was taken by the Cid, but after his death was recovered by the Moors, from whom it was taken by Jago I. of Arragon in 1238, and united finally to that kingdom in 1319. Subsequently to 1609 it declined from the expulsion of the Moriscoes, in 1706 it declared for Carlos III., and in the Peninsular War held out bravely against the French. In 1835 a revolutionary junta here declared against Queen Isabella; and here, in 1840, Queen Christina abdicated her regency. In 1852 it was the locality of a fruitless Carlist plot.

Valenciennes, an important manufacturing town of France, in the Department du Nord, on the borders of France and Belgium at the junction of the Rouelle and Scheldt, and is connected by rail with Paris, Amiens, and Lille. The fortifications and citadel constructed by Vauban still stand; the town contains also an art gallery and museum, a gymnasium, and other higher schools, and a library of 25,000 vols. and over 800 MSS. Besides the trade which accrues to it as the custom-house station between France and Belgium, V. has extensive foundries, distilleries, flax mills, sugar-refineries, &c. Its lace has long been celebrated. Pop. (1876) 26,083. V. appears in the earliest times of the Frankish empire as *Valentia*, and in the 11th c. its favourable situation made it the chief city of Hennegau, and, while it belonged to Flanders, a favourite residence of the Flemish counts. In 1677 it was taken by Louis XIV.

Val'ens, Fla'vius, Roman Emperor in the East, was born in Pannonia about 328, and was invested with imperial authority by his brother Valentinianus, who reserved for himself the government of the West. The principal events that distinguished the reign of V. were (1) the revolt of Procopius, who was accepted as Emperor by the people of Constantinople during the absence of V., but was defeated and executed (366); (2) the Gothic war, which lasted during the whole of V.'s reign. At first the Emperor was successful, and concluded an honourable peace with the barbarians (370). Six years later the Goths, pressed southward by the Huns, asked and obtained permission to settle within the empire. Lands were allotted to them S. of the Danube, and under wise management they might have become a powerful bulwark of the empire; but incited to revolt by the treatment they received at the hands of the imperial officials, they took up arms. In 378 they defeated V., and destroyed two-thirds of his army. The Emperor himself was never seen after the battle, and we have no certain information as to the manner of his death. During this reign the controversies between the Catholics and Arians were of an extremely bitter character. V. was himself an Arian; and through his influence this form of faith became widely spread in the East, and was adopted by the Goths. See Gibbon, chapters xxv. xxvi., and Tillemont's *Histoire des Empereurs*, vol. v.

Valen'tia (called by the people of Munster *Darrery*, from a famous 'Druid' prince, Dairbhre, who had his seat here), an island on the S.W. coast of Ireland, belonging to County Kerry, from which it is separated by a narrow channel opening into V. Bay. Area 6371 acres; pop. (1871) 2139. The harbour on the N. side of the island is the most western in Ireland, and from it two telegraph cables extend to Newfoundland, one laid in 1865, the other in 1866.

Val'entine, Bas'il, an eminent alchemist who flourished about the 15th c., and was probably a monk. So little is known of him, however, that it has been conjectured that the name is an assumed one. He wrote many works with quaint titles on alchemy and medicine, and these show him to have been an acute observer and able experimenter. He gave much of his attention to medicine, 'was the first who counselled the internal use of antimony, and recommended preparations of mercury for syphilis,' then believed to be a new disease. His works, written in the old Upper Saxon dialect, are said to have been concealed inside a column at the abbey of Erfurt. A stroke of lightning broke the pillar and disclosed the treasure, which was first printed in 1602. See Lenglet, *History of the Hermetic Philosophy*, vol. iii.; Hœfer, *Histoire de la Chemie*, vol. i.

Val'entine's Day falls on the 14th of February in each year, and is now commemorated in Britain and some parts of the Continent by a custom among young persons of both sexes of exchanging sentimental or ludicrous *souvenirs*. The saint whose name is attached to the day has nothing in the history of his life to justify this custom. He was a priest who assisted the Christians during the persecution under Claudius II., for which he was seized and put to a most painful death, being first beaten with clubs and then beheaded (about 270). A church was built to his honour at Rome by Pope Julian, and in that city his relics were collected and preserved, while his name was taken to Christianise an old festival of his murderers. V.'s D. is probably a continuance of the feast in honour of Pan and Juno, called the Lupercalia, and annually held in Pagan Rome with all sorts of obscene rioting about the middle of February. Long after the introduction of Christianity the feast continued to be observed, and as the clergy could not destroy the custom, they resolved to adopt it, and placed it under the patronage of the saint of the day. Some centuries ago it was the custom in our island for a number of a young people to write each a name, place the papers in a box, and drawing from thence to obtain a 'Valentine.' The chosen party gave a present to his or her chooser; and in the case of persons of high rank these presents were often very valuable. It was supposed that the birds mated on this day, and this no doubt gave rise to the Valentine customs. Perhaps, too, the feast might be taken to indicate human joy in the prospect of reviving nature. In many of the English poets—Chaucer, Lydgate, Shakespeare, Drayton, Donne, and others—and in a number of popular ballads, we find allusions to the customs of this day.

Valentin'ians, a Gnostic sect founded by Valentinus, probably a Jew, who came from Rome about 140. His system of theology was briefly as follows:—From the great Original (*Bythos, Propator, Proarche*) emanate male and female *æons* (manifestations of him who is incomprehensible) in pairs, to the number of thirty; who together form the Pleroma. From the passionate striving of the last æon, Sophia, to unite with Bythos, arises an untimely being, Achamoth, who communicates the germ of life to matter (thereby producing disharmony in the Pleroma, by mixing the divine element with matter), and forms out of *psychical* matter the Demiurge, who in turn immediately creates the world. The existence of all created beings depends on *limitation*; and to Horus, the genius of limitation, two operations belong—a *negative* one, by virtue of which he separates the godlike from the ungodlike; and the *positive*, by which he establishes in their own peculiar essence those who are purified from the foreign elements by which that essence had been disturbed. It was this Horus or Saviour who was united with the man Jesus, the Messiah who had been provided by the Demiurge.

Valentinia'nus, the name of three Roman Emperors.—**V. I.** was born in Pannonia in 321, entered the military service, filled various important posts, and on the death of Jovian in 364 was raised to the purple by the troops at Nicæa. He assumed the government only of the Western part of the empire, and assigned the East to his brother Valens. His whole reign was one long struggle against the encroachments of the barbarians, who from so many quarters were attacking the empire. His endeavours were attended with a considerable measure of success. He defeated the Alemanni, strengthened by fortresses the Rhine frontier, and even made successful incursions into the territory of the enemy. V. was a Catholic, but he molested neither Arians nor heathens, and showed himself rather anxious to improve and defend his vast dominions than to engage in the theological strifes of the period. He died suddenly, November 13, 375, when on an expedition against the Quadi and Sarmatians. —**V. II.**, son of the preceding, who had been proclaimed emperor by the army, was but four years old at the time of his accession. He only succeeded to Italy, Illyricum, and Africa, as his elder brother Gratian retained Gaul, Spain, and Britain. In 387 V. was driven from Italy by Maximus, who had slain Gratian; but next year he was restored, and invested with the government of the empire in the West by Theodosius, then emperor in the East. On May 15, 392, V. was murdered by Arbogastes, a Roman general of Frankish origin, whom he had incensed by attempting to deprive of his command.—**V. III.**, Emperor in the West, was the grandnephew of the preceding and the son of Constantius III. He was born about 419,

and succeeding to the throne when only six years of age, the real power was for long held by his mother Placidia. The Vandals, the Goths, and the Huns (under Alaric) made fearful inroads into the empire during this reign, and the first of these took possession of Africa, which they held for a century. The empire was bravely and skilfully defended by the experienced general Aëtius, but during a quarrel with the emperor the latter drew his sword and slew his able commander (454). Next year V. was assassinated by Petronius Maximus, who thus avenged the violation of his wife's honour by the emperor. See Gibbon's *Decline and Fall*, chap. 25, *et seq.*; Tillemont's *Histoire des Empereurs*, vols. 5 and 6; and Siever's *Studien zur Geschichte der Römischen Kaiserzeit* (Berl. 1870).

Valen'za, a town of N. Italy, province of Alessandria, on the right bank of the Po, 9 miles N.E. of Alessandria by rail. Its cathedral is of the 16th c. V. has some manufactures and a trade in wine. Anciently a town of the Liguri, it was taken by Marcus Fulvius, who named it *Forum Fulvii, quod Valentinum*. After a siege of ninety days, it was taken by the armies of France, Savoy, and Parma in 1635, and its fortifications were razed by the French in 1805. Pop. (1874) 9835.

Vale'rian (*Valeriana*) is the type genus of *Valerianaceæ*, an order of herbs or rarely shrubs belonging to the division of monopetalous dicotyledons having the stamens arising from the petals. The order is distinguished from its congeners by the opposite leaves; small irregular flowers in which the corolla lobes are imbricate; stamens, one to three or five, free; ovary one to three celled, one cell one-ovuled; ovule pendulous; seeds exalbuminous. It contains 12 genera and about 190 species, distributed through Europe, N. Africa, temperate Asia, and N.-W. America—unknown in Australia, and only one species S. African. The properties are aromatic, antispasmodic, sometimes stimulant. The genus *Valeriana* numbers 130 species. Of these, *V. officinalis*, ranging across N. and Central Europe and Asia to Japan, is a common British plant. Its rootstock has long been valued as an antispasmodic, and is successfully employed in hysteria. It has a penetrating odour, and a bitter, acrid, somewhat aromatic taste; when distilled with water it yields a volatile oil and Valerianic Acid (q. v.). Cats have a strange liking for the odour, and it exercises a remarkable intoxicating or stimulating power over them; the plant is sometimes called Cats' V. The roots of *V. celtica* are used by Eastern nations as a substitute for spikenard for aromatising their baths, and those of *V. edulis* as an article of food by the Indians of N.W. America. The Red V. (*V. pyrenaica*), a native of S. France and Spain, has become naturalised in parts of Britain, and several other species are commonly grown in gardens. The word V. is from Latin *valere*, 'to heal,' and one of the names of *V. officinalis* is 'all-heal.'



V. officinalis.

Valerianell'a. See CORN SALAD.

Valeria'nus, Pub'lius Licinius, a Roman emperor of a noble family, born about 193 A.D., entered the service of the state, filled several important posts, and on the murder of the Emperor Gallus and the sudden death of his rival Æmilianus, was elected emperor (253) in 'right of his merits, and by the unanimous voice of the whole world.' V. spent his reign in repelling the attacks of the barbarian hordes who were attacking the empire on all sides. He defeated the Goths (257), and waged war in person and for some time successfully against the Persians, who had overrun Syria, but was finally captured by the enemy at Edessa (260), and spent the rest of his life in captivity. On his death his barbarous foes stuffed his skin and preserved it as a trophy. In more peaceful and prosperous times V. would have been classed among the 'good emperors.' Hard fate ranks him only among the 'unfortunates.' See Gibbon's *Decline and Fall*, chap. x.

Valer'ic, or Valerian'ic Acid ($C_5H_{10}O_2$), an organic acid present in valerian root, angelica root, in the berries of *Viburnum opulus*, and probably in many other plants. It is prepared artificially by oxydation of ordinary amyl alcohol ($C_5H_{12}O$), two atoms of hydrogen being removed and one of oxygen added. The most advantageous method of effecting the oxidation is to treat the amyl alcohol with a mixture of sulphuric acid and potassium dichromate. After a series of operations the V. A. separates as an oily liquid lighter than water and having the composition $C_5H_{10}O_2H_2O$. The water is driven off by distillation, and the pure acid obtained as a mobile colourless oil. It has a sharp acid taste, reddens litunes, and burns with a bright but smoky light. It has a density of ·937, and boils at 175°. It forms valeriates with metallic oxides, but its compounds are not of much importance. Ethyl valerate ($C_2H_5C_5H_9O_2$) is formed by passing hydrochloric acid gas into an alcoholic solution of V. A.

Vale'rius Max'imus, a Roman historian, wrote between 29 and 32 A.D. the extant *Factorum Dictorumque Memorabilium libri ix. ad Tiberium Cæsarem Augustum*, a large collection of historical anecdotes arranged under miscellaneous heads. The style of V. M. is forced and cumbrous; 'his Latinity,' said Erasmus, 'is no more like Cicero's than a mule is like a man.' Of this work we also possess two abridgments, by Julius Paris and by Januarius Nepotianus, published by Mai in 1828. The *editio princeps* of V. M. is by J. Mentelin of Strassburg, 1470. The best editions are by Aldus Manutius (Ven. 1534), Lipsius (Antw. 1585), Kempf (Berl. 1854), and C. Halm (Leip. 1865).

Valett'a, the capital of Malta, and a strong fortress, beautifully situated on the N. side of the island on a promontory with deep bays on either side. The harbour on the S.E. side is rendered nearly impregnable by the Fort of St. Elmo and other batteries. V. has a vast fortification garrisoned by some 3000 men, and is the station of several war vessels. Its harbour, which has a depth of 50 feet, is one of the best in the Mediterranean, and from the quay the streets ascend precipitously, in many places rising in long flights of steps. The buildings comprise a richly decorated cathedral of S. Giovanni (1576), which contains monuments of grand-masters and knights of Malta, the governor's palace, with collections of weapons, trophies, &c., and a library of 60,000 vols. V. is supplied with water by an aqueduct begun in 1610, and has a botanic garden and ramparts adorned with many statues of grand-masters and English governors. On the E. side of the harbour lies Borgo or Citta Vittoriosa, the older part of the town, and farther distant Burmula or Citta Cospicua with its new docks. V. is the chief trading port of Malta and an important naval station on the route to Egypt and India. Pop. 70,000. V. was founded by and named after the Grand-master Valette in 1566.

Valette', Jean Parisot de la, born of a noble family at Toulouse, France, in 1494, entered the Order of the Knights of St. John (q. v.), and on the 21st August 1557 was elected its grandmaster. Within five years he captured 50 great Turkish galleys and a great number of smaller vessels, thereby provoking the Sultan to attempt the annihilation of the Order. With 159 war-ships and 30,000 select troops the Turks began their famous siege of Malta on the 18th May 1565. The fortifications were defended by 8500 men, with but 700 knights (not including 'serving brothers'), but with these V. fought heroically till the 8th September, when the viceroy of Naples came to reinforce the gallant garrison, now dwindled to 600 souls. After another vain attack the besiegers finally withdrew. On the 28th March 1568, V. laid the first stone of the town of Valetta (q. v.), which, with its suburb *Vittoriosa*, commemorates his name and memorable victory, and where V. died on the 21st August of the same year. See Vertot, *Histoire des Chevaliers de Malte*; De Thou, *Historia sui Temporis*; and Porter, *Knights of Malta* (vol. ii.).

Val'gus is a term employed in surgery to designate a variety of Club-foot (q. v.).

Valhall'a (Old Norse *Valhöll*, from *val-r*, 'corpses,' and *höll*, 'hall,' *cf.* O. H. G. *halla*), in Northern Mythology (q. v.), the chief hall in Asgard, the banqueting-house of the Æsir (q. v.), there entertained by Odin along with the *Valr* or

Einherjar chosen by the Valkyrjur (q. v.).. V. has 540 doors, through each of which 800 Einherjar may pass abreast. In front is the grove Glasir, whose leaves are golden. West of the door is a great wolf, and overhead a crouching eagle. Gleaming swords light up the hall. The roof-trees are spears, the roof itself is formed of shields, and the seats are covered with shirts of mail. The Einherjar eat the flesh of the boar Sæhrímnir, which is cooked every day, and at night is restored whole as before; and drink mead, which flows from the udder of the goat Heidrun. Every day the Einherjar, as soon as dressed, array themselves in armour, and fare forth into the fields to fight and fell one another. This is their pastime; as it draws to breakfast-time they ride back to V., where they sit down to feast. After Odin's V. is named the Walhalla or Temple of Fame built by King Ludwig I. of Bayern at Donaustauf, near Regensburg (q. v.).

Valkyr'jur [from Old Norse *val-r* (Old High Ger. *wal*), 'corpses,' and *kjora* (Dan. *kaare*, Ger. *küren*), 'choose'], in Northern Mythology (q. v.) are the beautiful 'maids of Odin,' goddesses of fate allied to the Norns. They numbered either nine or thrice nine, and in three bands went forth on horseback and clad in full armour, through air and water, over the wide world to *choose* for Odin the *Valr* or *Einherjar* ('single champions') worthy of Valhalla (q. v.). At home in Valhalla the V. were the cupbearers of the Æsir (q. v.) and the Einherjar. The belief in the V. toward the close of the heathen period may be seen in the *Njalsaga's* description of Daurrud's vision on the day of the battle of Clontarf (q. v.). Twelve women came riding through the air and entered a hillside. Through an opening Daurrud saw them there weave a web of men's entrails, with a sword for batten and arrows for shuttles. They sang the while a song: 'The web, the web of war is weaving for the fight: bloody shall be the fray; a king shall conquer: a mighty king and great chieftains shall be slain.' Another moment, and the web was slit in two. With one-half six of the V. hurried to the N. and vanished, while six sped southward with the other half. The incident has been finely told by the poet Gray in his ode, *The Fatal Sisters*.

Vall'a, Lorenzo della, born at Rome in 1407, studied Greek and Latin under the leading masters, and having failed to succeed to an uncle's post of apostolic secretary, took orders (1431), and accepted the chair of Latin eloquence at Pavia. About this time his *De Elegantiæ Latinæ Linguæ Lib. VI.* (Rome 1471) established V. as the supreme authority on Latin style; and having lectured successively at Milan, Genoa, and Florence, he received from Alfonso V. of Naples a private secretaryship along with the poet's crown (1437). The feud between Rome and Aragon made Alfonso glad to secure so fierce an opponent of the papal see as V., who in *De Falso Credita et Ementita Constantini Donatione* (1440) assailed pope and cardinals, and demolished a lie imposed upon Christendom for centuries. The storm excited by this treatise drove V. awhile to Barcelona, but returning to Naples he continued his assaults, impeaching the Vulgate's Latinity, the authenticity of the Apostles' Creed, and of Christ's letter to Abgarus; and when cited before the Inquisition, declaring the Church knew nothing yet he believed with her. Pope Nicholas V., however, succeeding Eugenius in 1447, summoned V. to Rome, and made him secretary; and he passed his remaining years in translating from the Greek, and in furious literary feuds with Poggio, Trapezuntios, and others among his compeers. He died at Naples, 1st August 1457, leaving behind him Latin translations of Herodotus, Thucydides, and the *Iliad*, *Annotationes in Novum Testamentum* (ed. by Erasmus, Par. 1505), &c., collected in the Basel edition (1543) of his works, and by Vahlen (Vien. 1869). See J. Vahlen's *Lorenzo V.* (Berl. 1870); and chap. v. of Symonds' *Renaissance in Italy: The Revival of Learning* (Lond. 1877).

Vallabhácharya, a Hindu reformer of the 15th c., whose followers form a most influential sect in Western and Central India at the present day. He is regarded as an incarnation of Vishnu; and his descendants, under the title of Maharajah or Gosain, are still treated with semi-divine honours. His system inculcates the worship of Vishnu by his name of Krishna (q. v.), in which form the god sported with the milkmaids; and it leads to self-indulgent and corrupt practices. A Puritan reaction within the sect was started by Swami-Narayan at the beginning of this century. See *History of the Sect of Maharajahs or Vallabhacharyas in Western India* by Karsandas Mulji (Lond. 1865), and Monier Williams' *Hinduism* (1877).

Valladolid', a city of Spain, in Old Castile, capital of the province of the same name, is situated on the left bank of the Pisuerga, and on the Irun-Madrid railway, 102 miles N.W. of Madrid. It is a fortress of the first rank and the seat of an archbishop, has a cathedral founded in 1585 by Philip II., many monasteries, a celebrated university founded in 1346, an institute, an Academy of Fine Arts, a museum containing many beautiful pictures and sculptures, a library, various seminaries and industrial schools, a theatre, hospitals, poor-house, &c. Of its 'plaze' the most beautiful are the quadrangular Plaza Mayor, the octagonal El Ochavo, and above all the triangular Campo Grande, where bull-fights, autos-da-fé, and other public spectacles, used to be held, and where Napoleon is said to have reviewed not fewer than 35,000 men. The manufactures of V., which have recently much revived, are chiefly of cloth, iron, and leather. Pop. (1870) 39,326. The old Roman town of Pintia is said to have been rebuilt in 625 by the Goths, but the name V. was first applied to it after its recovery from the Moors about 1072. From this time till Karl V. transferred the court to Madrid, V. was a favourite residence of the Kings of Leon. It was the birthplace of Philip II.

Valladolid', a town of Yucatan in Mexico. Pop. 10,000.

Valle'jo, a city and seaport of California, on an arm of San Pablo Bay, and on the California Pacific Railway. It has a spacious harbour, a street railway, and several flour-mills, ship-yards, iron-foundries, machine-shops, and broom-factories. V. exports large quantities of grain, and supports six churches and one weekly and two daily newspapers. Pop. (1870) 6391.

Vall'eys, the general name under which all surface depressions flanked by rising-ground are included, are as a rule the result of denudation directed in great measure by the heterogenity of the earth's crust. The countless rills, streams, and rivers which are among the great agents in effecting this wearing action, are the more effectual in their erroding work the softer the material through which their channel for the time being is directed. Hence the harder portions of the earth's crust not being affected so easily are left as hills and mountains, while the softer portions are worn away, and valleys are the result. The scooping action of glaciers must not be overlooked; but it is doubtful whether glaciers could *begin* the formation of a valley as effectually as running water. Volcanic action no doubt has in many cases primarily determined the surface configuration, which has then been intensified in its characteristics by denuding influences; but the theory that in general V. have been wholly or in great part the result of denudation is supported by one of the marked peculiarities of valley structure, namely, that V. meet at an acute angle pointing down their course, exactly as rivers naturally do. Geologically, V. are of great importance, as affording natural sections of the formations which compose the earth's crust at any place. Many facts bearing upon the nature and formation of V. are noticed under MOUNTAINS, RIVERS, GLACIERS, &c.

Vallisne'ria, a genus of freshwater plants belonging to *Hydrocharidaceæ*, consisting of two species, of which *V. spiralis*, occurring in S. Europe, and widely spread over temperate and tropical regions of the world, is a favourite plant for aquaria. The long, narrow, grass-like leaves, from their tenuity and transparency, show in a most instructive manner, under the microscope, the movement of the cell contents; and the mode of fertilisation in this plant is highly curious. Male and female flowers are borne on different individuals; the former become detached, and rise and float on the surface of the water, to which level they are followed by the female, borne on a long spirally-twisted peduncle or stalk. After fecundation, the peduncle contracts and brings the ovary down to the bottom to mature.

Vallombro'sa (Ital. 'shady vale'), a Tuscan abbey, seated in a secluded valley of the Apennines, some 24 miles E.S.E. of Florence, and 2980 feet above the sea. Founded by St. Giovanni Gualberto, Lord of Pistoja, about 1058, for monks of the Benedictine Order, the abbey received many rich endowments, out of which was reared the present spacious and stately pile (1673). Since the suppression of monasteries in 1869, the greater part has been converted into an *Instituto Forestale*

('school of forestry'), but two monks still (February 1879) linger in the 'convent' as a memorial of the vanished Past. Milton's mention of V. in *Paradise Lost* has made the name familiar to Englishmen—

> 'Thick as autumnal leaves that strew the brooks
> In Vallombrosa, where the Etrurian shades
> High overarch't imbowr.'

Valls, a town of Spain, province of Tarragona, on the Francoli, 8 miles N. by E. of Reus by rail. It has extensive manufactures of paper, brandy, cottons, linens, leather, soap, &c. Pop. 16,500. The French gained a victory here over the Spaniards, 25th February 1809.

Val'my, a village of France, department of Marne, 20 miles N.E. of Châlons, is celebrated for the repulse of the Prussians under the Duke of Brunswick by Kellerman, 20th September 1792. This, the first victory of the Republicans, had an important influence on the subsequent course of the war, by the confidence with which it inspired the nation in their troops and generals.

Val'ois, a former county, then duchy of France, included now in the departments Oise and Aisne. The last survivor of the ancient counts, who belonged to a younger branch of the house of Vermandois, married Hugo, the son of Henri I., and brought as her dower V. and Vermandois. Out of this marriage sprang the Vermandois of the line of Capet (q. v.), on whose extinction in the sixth generation Philippe II. annexed lands and title to the crown of France. Philippe III. bestowed V. on Charles, his younger son (1285), whose son ascended the throne of France as Philippe VI. (q. v.) in 1328, and was first of thirteen French kings of the House of V.—Jean II. (b. 1310; succeeded 1350; died in the Tower of London, 1364), Charles V. (q. v.), Charles VI. (q. v.), Charles VII. (q. v.), Louis XI. (q. v.), Charles VIII. (q. v.), Louis XII. (b. 1462; succeeded 1498; d. 1515), François I. (q. v.), Henri II. (q. v.), François II. (q. v.), Charles IX. (q. v.), and Henri III. (q. v.). By the death of the last without male issue in 1589 the succession passed to the House of Bourbon (q. v.), and V. from the time of Philippe d'Orleans, brother of Louis XIV., belonged as a duchy to the Orleans family. See FRANCE.

Valo'nia, the commercial name for the acorn-cups of a species of oak named *Quercus Ægilops*, a native of S. Europe, Asia Minor, and Syria. V. is largely used by tanners and dyers, and forms an article of considerable export from Asia Minor.

Valparai'so ('the vale of Paradise'), the chief seaport of Chili, is situated in a province of the same name, 90 miles W.N.W. of Santiago (q. v.), the capital, with which it is connected by railway. It is built at the base of steep, bare hills about 1600 feet high, and round the head of a bay which possesses good anchorage, but is exposed to northerly winds, and therefore unsafe in winter. The streets are narrow and often steep, but are well paved, and some of them are traversed by tramways. The houses are substantial, and often elegantly decorated. The public buildings include a number of important educational and charitable institutions, besides churches and theatres. The city has been greatly damaged by earthquakes on various occasions (notably in 1822, 1829, and 1851), as well as by a bombardment by a Spanish fleet on 31st March 1866. The climate is good, but dry, little rain falling except during the three winter months. The annual mean temperature is 58°. V. is the headquarters of the Pacific Steam Navigation Company, which was inaugurated in 1840, and in 1877 had a fleet of 58 vessels and a capital of £4,000,000. The total value of the import trade of V. in 1877 was $15,667,440, and of the exports $8,900,020. The chief items of the latter were copper and copper ore, gold, silver, cereals, wool, hides, and tallow. The pop. of the province (1877) was 180,324, and of the city (1875) 100,926, of whom 6738 were foreigners, chiefly English, Americans, and Germans.

Val'py, Richard, D.D., born in Jersey, 7th December 1754, from the college of Valognes (1764-69) in Normandy proceeded to Southampton Grammar School, and thence to Pembroke College, Oxford. Ordained in 1777, he held a living at Bury-St.-Edmunds, and from 1781 to 1830 was head-master of Reading Grammar School, which he raised to a state of high efficiency. He died at Kensington, 28th March 1836. His Greek and Latin Grammars enjoyed in their day a great reputation; and his brother Edward V. (1764-1832), head-master of Norwich School from 1810, was also well known by his *Elegantiæ Latinæ* (1803; 11th ed. 1836), an edition of the Greek Testament (3 vols. 1810), and other works.

Val'ue, in common language, means worth. But this worth may be of two kinds, V. in use and V. in exchange. Thus air has great V. in use, but in exchange it has none at all; whereas a bank-note has V. only in so far as it can be exchanged. In political economy it is only V. in exchange that we consider. Its discussion is one of the most important parts of that science. The main outlines of the theory of the subject may be thus stated: V. ultimately depends on mental appreciation, and that is determined by two elements, utility and difficulty of attainment. Utility alone does not make a thing valuable, neither does difficulty of attainment; V. depends on the existence of both. Accordingly, as these exist in a greater or less degree, we will procure a greater or less quantity of something else in exchange for the special article, and that is what we mean by V. It follows that V. is a relative term. It represents the relation of one thing to another. If A = B to-day and = 2B to-morrow, we say that the V. of A has risen, but we may also say the V. of B has fallen. Thus a general rise or fall of values is impossible. We may make this assertion of prices with perfect truth. The reason is that price is a particular case of V., but what do we mean when we say that there has been a rise in prices? Simply that the V. of money has fallen. It follows from this that there can be no invariable standard of V., although economists of such eminence as Adam Smith, J. B. Say, Ricardo, Malthus, Torrens, and James Mill, led away by false notions of the cause of V., have maintained that such a standard to be of any use at all must be invariable. It is quite true that the standard must not fluctuate rapidly, and this has been so generally though perhaps unconsciously recognised, that in all civilised countries the precious metals have been selected to fulfil this purpose. Three classes of articles possessing V. are recognised in political economy—(1) those which are strictly limited in quantity, as antique gems or pictures by a dead artist; (2) those of which the quantity can be increased, but only by the expenditure of a proportionally greater quantity of labour, as agricultural and mining produce from a limited area; (3) those whose quantity can be (practically) indefinitely increased without increase of cost of production. The V. of the first of these depends on the 'effectual' demand, meaning the mental appreciation of those able to pay a sufficient price for them; as is the demand so is the V. In the case of articles of the second class, the efficient demand also regulates the V., but not so exclusively, nor is the price forced up so rapidly by an increased demand or lessened supply. In no case can the price of these fall permanently below the cost of production, by which phrase we mean the ordinary remuneration to the capital and labour employed in their production. The V. of the third class of articles is in the long run determined by cost of production, though at any particular period and within a small limit by supply and demand. In a free country the competition of capital prevents any trade from reaping for a long period exceptional profits. Thus, if there be a great demand for guns, the price rises rapidly, but this attracts men of means into the trade, new manufactories are built, any required amount of guns are made, and as the supply becomes increased the price falls. Indeed it generally happens that in cases of this kind the thing is overdone and the market glutted. The V. of the article then falls for a considerable period. This is in brief the explanation of the ups and downs which we often observe in the history of some trades, such as the cotton, which are liable to violent fluctuations. It is to be carefully noted that the theory stated above is liable to many apparent exceptions. The actual exact price of an article is often dependent on the respective degrees of shrewdness that the buyer or seller may possess; what Adam Smith has termed the 'higgling of the market.' But the economic laws that regulate V. always act ultimately with powerful effect. As has been expressively said, they are like the force of the sun's attraction which determines the elliptical path of a planet's motion, which path is on the whole preserved, even though the real motion of a planet actually consists of endless deviations from it. See Bailey's able treatise on V. (Lond. 1825), as also the works of Ricardo, J. S. Mill, Fawcett, and De Quincey, for a full exposition of the subjects.

Vám'béry, Armin'ius or **Her'mann**, a distinguished traveller and orientalist, was born in 1832, of Jewish parentage, at Szerdahely, in Hungary, on an island of the Danube. Escaping from the tailor's bench to which his family would have condemned him, he succeeded amid much privation and hardship in laying the foundations of wide linguistic scholarship, first under the Piarists of St. Georgen near Pressburg, and afterwards at Vienna and Pesth. Expelled from Pesth by the Austrian authorities for his connection with the Revolution of 1848, the young teacher of languages removed to Constantinople (1854), and there maintaining himself as French tutor to Afif Bey and Rifaat Pasha, he made a thorough study of Arabic, Turkish, and Persian. In 1863, under the auspices of the Academy at Pesth, he successfully accomplished a most adventurous journey in Turkestan, passing in safety, under the disguise of a dervish and the pseudonym of Reshad Effendi, through the fanatical Mohammedan cities of Khiva, Bokhara, and Samarcand. He still holds the chair of oriental languages and literature in the University of Pesth, to which he was appointed in 1865; and he has become universally known not only as a master of Eastern lore, but as one of the keenest observers of Eastern politics. A strong believer in the regenerative power of Western civilisation, he is almost as strongly a partisan of English as opposed to Russian influence. Besides the narrative of his great journey, which appeared in German, English, and Hungarian in 1865, he has published *Deutsch-Türkisches Wörterbuch* (Constan. 1858), *Abuschka: A Dschagatai-Hungarian Dictionary* (Pesth, 1861), *Dschagataische Sprachstudien* (Leip. 1867), *Sketches in Central Asia* (Lond. 1867), *Wanderungen und Erlebnisse in Persien* (Leip. 1868), *Uigurische Sprachmonumente und das Kudalku-Bilik* (Leip. 1870), *Geschichte Bokhara's* (Stuttg. 1872; in English, *History of Bokhara*, Lond. 1873), *Central Asian and Anglo-Russian Frontier Question* (Lond. 1874), *Islam im 19 Jahrhundert* (Leip. 1875), *Sittenlehre aus dem Morgenland* (Berl. 1876), *Etymologisches Wörterbuch der Turkotatarischen Sprachen* (Leip. 1877). V. is a frequent contributor to periodical literature in England, Germany, and Hungary.

Vam'pire, the name applied to various species of *Cheiroptera* (q. v.) or Bats belonging to the family *Phyllostomidæ*. Although natives of S. America, they also occur in California and the southern parts of the United States. The nose and ears are provided with foliaceous or leaf-like appendages. The typical V. bat is the *Phyllostoma spectrum*, which attains an expanse of wing measuring 2½ feet. It has undoubtedly the habit of sucking the blood of quadrupeds. The genera *Desmodus* and *Diphylla* also include species of V. bats. In *Desmodus* the stomach has its anterior end dilated so as to form a great sac or bay, larger than the animal's body, and which lies folded on itself. The purpose of this sac is to receive the blood, which is thence slowly drawn into the intestine. The two upper incisors in these bats are sharp and pointed, and the four lower incisors are comb-like. The canines are large and sharp, and the molars (two above and three below in each side of each jaw) have sharp crowns.

Vam'pire (Russ. *vampir*, South-Russ. *upuir*, anc. *upir*, perhaps from a root *pi*, 'to drink,' with the prefix *u*, *av*, or *va*), the ghastly creation of a widespread superstition, rifest among Slavonic races—a demon, namely, that sucks the life-blood or devours the heart of its sleeping victim. Such demons are held in White Russia and the Ukraine to be dead wizards, were-wolves, heretics, and such-like outcasts; but by Bulgarian and Servian belief, any one, whatever his former life, may become a V., over whose corpse a cat or boy jumps, or a bird takes its flight. Earth rejects these monsters, who therefore know no decay; and on the discovery of a V.'s grave—effected in Servia by driving a coal-black colt through the churchyard, and marking the spot that he will not pass—the body, all fresh and ruddy, must be disinterred, thrust through with a white-thorn stake at a single blow, and burnt. The English custom of piercing suicides' bodies with a stake was a late survival of the same belief, which Tylor recognises in the Polynesian *tii* or departed spirits that steal from their graves to feast on a sleeper's heart and entrails, in the *hantu penyadin* of the Malayan Mintira, the dog-headed water-demon with alligator mouth which sucks men's great toes and thumbs so that they die, and in the Karens' *kephu* or wizard's stomach, which, under the form of a head and entrails, eats human souls. Tylor, ascribing the superstition to 'Animism,' considers vampires to be 'causes conceived in spiritual form to account for specific facts of wasting disease;' while Afanasief regards them as the thunder-god and spirits of the storm, who during winter sleep in their cloud-coffins a deathlike sleep, but with spring's return assume new life, 'and draw rain from the clouds, or, in mythical language, suck blood from sleepers.' See vol. ii. ch. 15 of Tylor's *Primitive Culture* (Lond. 1871), Ralston's *Songs of the Russian People* (2d ed. Lond. 1872), and his *Russian Folk Tales* (Lond. 1873).

Van, a fortified town of Armenia, Asiatic Turkey, about 145 miles S.E. of Erzerûm, on the S.E. shore of lake V. The town is neglected and in part ruinous. It is the seat of a governor, has a citadel and ruined fortifications, carries on cotton manufactures, and trades in fish, fruits, goatskins, and potash. Several cuneiform inscriptions have been found in the vicinity. Pop. 12,000-15,000 (chiefly Armenians). Lake V. has an area of 1424 sq. miles; it receives eight streams, but has no outlet. Its water is salt.

Vana'dium (V = 51·2), a rare metallic element occurring in nature as the vanadate of lead and the vanadate of copper. The metal, obtained by the ignition of the dichloride in hydrogen, is a greyish-white powder minutely crystalline. It burns vividly in oxygen, is insoluble in hydrochloric acid, dissolves slowly in hydrofluoric acid with evolution of hydrogen, and rapidly in nitric acid. It forms five oxides, of which the *dioxide* (V_2O_2) was regarded by Berzelius as the element itself. Indeed, many of the V. compounds may be looked upon as compounds of *vanadyl*, as this radical is called. The tetroxide (V_2O_4) or vanadious oxide is obtained in blue shining crystals by oxidation of the trioxide (V_2O_3) and dissolves in acids, forming bright-blue solutions of vanadious salts. It also acts upon the more basic metallic oxides forming *vanadites*, all of which, excepting those of the alkali metals, are insoluble in water. The pentoxide or vanadic oxide (V_2O_5) has a reddish-yellow colour, yields crystalline compounds (vanadic salts) when treated with the stronger acids, but acts more readily upon bases forming *vanadates*. Three chlorides are known, and four oxychlorides, or, as they may be called, vanadyl chlorides. Corresponding bromides have also been obtained, as also sulphides and nitrides.

Van'brugh, Sir John, an English dramatist and architect of the 17th c., son of Giles Fletcher of Chester, a Fleming by descent and a sugar-baker by trade, who married a daughter of Sir Dudley Carleton, and was considered by Thomas Fuller worthy to serve as patron to a portion of his *Pisgah Sight of Palestine*. Of V.'s early years nothing is known except by inference. He entered the army, and appears to have attained the rank of captain. In 1695, at John Evelyn's recommendation, he was appointed secretary to the commissioners for completing Greenwich Hospital. In 1697 his first play, *The Relapse*, was acted at Drury Lane; its brilliant success was at once brilliantly followed up by *The Provoked Wife* at Lincoln's Inn Theatre. His next effort, *Æsop*, was a failure with the crowd on account of its ostentation of moral instruction; but he somewhat regained his place by *The Pilgrims* in 1700. In 1702 he appeared in the new character of architect, and his designs for Castle Howard were so highly appreciated that his hands were soon full of similar commissions; and when the erection of Blenheim Palace was decreed by Parliament, he was entrusted with the preparation and execution of the plans. While engaged on Blenheim he built a theatre in the Haymarket, and brought out his dramatic masterpiece, *The Confederacy* (1705). In 1703 the Earl of Carlisle, for whom Howard House was designed, had procured V. the post of Clarencieux King-at-Arms, and as such he conveyed the insignia of the Garter to the King of Hanover in 1706. In 1714 he was appointed Comptroller of the Royal Works, and in 1716 surveyor of the works at Greenwich Hospital. He died March 26, 1726, leaving unfinished the play of *The Provoked Husband*. As a dramatist, V. displays the same kind of vivacious wit and undisguised indecency which characterised the other dramatists of the day; but he has a naturalness and fluency peculiar to himself. Collective editions of his plays were published in 1730, 1735, 1759, and 1776, and in 1840 Leigh Hunt associated them in one volume with those of Wycherley, Congreve, and Farquhar. See Leigh Hunt's *Biograph. and Crit. Notice*; several valuable letters of V. published by Hepworth Dixon in *Athenæum*, January 19, 1861; and *Notes and Queries* (2d Series. vols. iii., iv., xi.).

Vancou'ver's Island, included in the Dominion of Canada as part of the province of British Columbia, lies off the Pacific coast in lat. 48° 20'-50° 55' N., and long. 123° 10'-128° 20' W. On the one side it is washed by the Pacific, while the Strait of Georgia and Puget Sound separate it from the mainland, and communicate with the ocean in the N. by Queen Charlotte's Sound, and in the S. by the Strait of San Juan de Fuca. V. I. is 300 miles long by 70 broad, and has an area of 18,750 sq. miles. The shores, especially in the W., are marked by beetling cliffs and picturesque fiords (called canals), while the interior is traversed by a mountain-ridge, which attains its greatest height of 7211 feet in Victoria Peak, of 6300 in Crown Mountain, and of 5900 in Mount Arrowsmith. The surface is in great part a waste of rocks, but here and there, especially in the S.E., there are large tracts of undulating, thickly-wooded land, alternating with grassy glades. The streams, none of which are navigable, descend in flood during winter. The climate closely resembles that of Scotland, except that it is more rainy. Only one-fifth of the surface is cultivated, but there is an abundant yield of wheat, oats, barley, root-crops, and apples. The arable soil, which is of the most productive character, is well adapted for all ordinary crops, except Indian-corn. V. I. is rich in minerals, containing valuble deposits of gold, copper, iron, silver, lead, and other ores, and of coal of Tertiary origin, part of which is anthracite of good quality. The forests are infested by the puma, bear, wolf, &c., and game is abundant, comprising two kinds of deer, wild-fowl, grouse, and snipe. The fisheries of salmon, sturgeon, cod, herring, haddock, halibut, whiting, &c., are very productive, and supply most of the towns along the American coast. The timber trade is only inferior in importance to the fisheries, and the woods exported include cedar of seven feet diameter, and white fir or Douglas pine, highly valued for making spars. There is some shipbuilding. The chief town is Victoria, which had a pop. in 1871 of 4540, and is the capital of Columbia. The census of 1871 gave no returns for the island apart from the province, but the predominating inhabitants are Indians, who number 18,000. They are mostly tribes belonging to the confederation of the Nootkas (q. v.), and have among them several missions maintained by the Roman Catholics. V. I. constitutes a Roman diocese, and contains three convents, one seminary (St. Louis College), and three academies. The Anglican churches are under the Bishop of Columbia. The island, originally called Nootka, was discovered by Juan Perez and Martinez in 1774, and partly explored by Quadra (1775) and Cook (1778), but first circumnavigated by Captain George Vancouver in 1792. After the American boundary dispute it was secured to Britain by the Oregon Treaty of 1846. It was leased to the Hudson Bay Company 1846-49, was constituted a distinct British colony in 1863, and finally united to Columbia in 1865. The projected Dominion-Pacific Railway is to be carried from the mainland to the island by means of a mighty viaduct over Seymour's Narrows.

Van'da, a genus of *Orchidaceæ* remarkable for the large size and great beauty of the flowers. There are about 20 species, all epiphytal and all natives of tropical Asia. *V. Batemanni, cærulea, gigantia, Lowii, suavis,* and *tricolor,* are among the most conspicuous orchids grown in European hot-houses.

Van'dals, a Teutonic people, originally inhabiting the lands between the Warthe and the Baltic, described as occupying the Riesengebirge at the time of the Marcomannic War (166-180 A.D.), and in the reign of Probus (276-282) dwelling to the N. of the Lower Danube, beside the Goths and Gepidæ, where they suffered much at the hands of the Goths till 334, when Constantine the Great assigned them settlements in Pannonia. About the beginning of the 5th c. they turned to the W., and in 406, along with the Suevi and Alani, under the leader Godegisel, entered Gaul, where they waged destructive war, till Godegisel fell in battle with the Franks. His son Gunderic then led the V. into Spain (409), where they were pressed by the West Goths to the central and S. parts, called after them *Vandalitia* (Andalusia). Hence their king Genseric or Geiseric led them over to Africa (429), where they conquered Carthage (439), and established an empire including the N. coast of Africa as far as Cyrenaica. The V. now took to piracy on the Mediterranean. In 455 Genseric disembarked at Ostia. Maximus being slain in a seditious tumult, Rome fell an easy prey to the V., who pillaged it fourteen days, and carried off by sea a rich booty. The queen, Eudoxia, two princesses, besides thousands of noble captives, were among the spoils. The unsparing destruction of the richest art-treasures of the capital by these irreverent barbarians has made *Vandalism* the common name for all such outrage. On the accession of Odoacer, King of the Heruli, to the kingdom of Italy (476), the V. obtained for their services Sardinia, Corsica, the Baleares, the Pityusæ, and the S. of Sicily. The death of Genseric in 477 marks the beginning of the decline of the Vandal power, which was hastened by the persecutions they as Arians carried on against the Orthodox Catholics. Genseric's successors were Hunneric (477-484), Gundamund (484-496), Thrasimund (496-523), and Hilderic (523-530). Gelimer having conspired against Hilderic his cousin, and seized the crown (530), Justinian sent an army to Africa under Belisarius, who landed at Caput Vedæ in 533, and defeated Gelimer near Carthage, which thereafter surrendered. Gelimer collected another army, but was decisively defeated by Belisarius in 534. After gracing the triumph of his conqueror he received an honourable exile in Galatia. What were left of the V. enlisted into the imperial army or disappeared among the races of Africa. See Papencordt, *Geschichte der Vandalischen Herrschaft in Afrika* (Berl. 1837).

Van'derbilt, Corne'lius, born of humble Dutch parentage at Staten Island, New York, 27th May 1794, after a meagre education turned waterman at an early age, and from his seventeenth year ran a ferry-boat of his own between New York and Staten Island. Thus and as schooner-master he had acquired $9000 by 1817, when, entering the service of Thomas Gibbons, he became captain of a New York-New Brunswick steamer, and an hotel-keeper at the latter place. In 1829 he started steamboats of his own upon the Hudson, in 1851 opened the Nicaraguan steam-line to California, and in 1855, having visited Europe two years before, established the Havre-New York service. His gift to Government of a splendid steamer (1862) earned him the thanks of Congress, and subsequently engaging in railroad enterprise, he became the president of four railway companies. One of the wealthiest of the Union's citizens, he presented $1,000,000 to the Central (now Vanderbilt) University of the Methodist Episcopal Church, which, founded at Nashville, Tennessee, in 1872, and opened in 1875, possesses the four departments of theology, law, medicine, and philosophy, and has 26 instructors and over 300 students. V. died at New York, 4th January 1877, leaving a son, William Henry W., who, born in New Brunswick, 8th May 1821, was elected vice-president of the Hudson River Railway Company in 1873.

Van'dervelde, Willem, a Dutch marine artist, son of Esaias V. (1587-1654), was born at Leyden (1610) and brought up to a seafaring life, but became an effective designer of shipping. He is said to have made drawings from actual observation of the battle between the Duke of York and Opdam and the memorable three days' engagement between Monk and Ruyter. Crossing to England in 1675, he was engaged as painter of sea-fights to Charles II. and James II. successively, with an annual pension of £100. He died in London, 1693. With absolutely no pretension to colour, his drawings are delicately finished, and have some value as historical illustrations. He is called 'the Elder,' to distinguish him from his son, **Willem V.,** commonly known as 'the Younger,' who was born at Amsterdam in 1633, and who surpassed his father as a painter of marine effects. Like 'the Elder,' he was a faithful art-chronicler of naval events, and by order of the Duke of York attended in a small vessel the engagement of Solebay, and from drawings made on the spot painted a large picture of the review of the English and French fleets by Charles II. at the Nore. He died at Greenwich, 6th April 1707. The best works of V. are in the Bridgewater Gallery. Ruskin says that instead of the tremulous, turbulent ocean of nature, the Vanderveldes painted waves 'that curl up like shavings,' with foam 'set astride' upon them 'like a peruke.'—**Adrian V.,** brother of the preceding, born near Rotterdam, 1659, was a remarkable painter of animals and landscapes, and also acquired a high reputation as an engraver. He died at Amsterdam, January 21, 1672.

Van Die'men's Land. See TASMANIA.

Van Dyck. See DYCK.

Vane, Sir Henry, one of the most prominent figures in the history of the Civil War and the Commonwealth, was born in

the year 1612. He was the eldest son of Sir Henry V. (1589-1654), afterwards Baron V., of Raby Castle, who filled several high offices of state under James I. and Charles I., but fell into disgrace through the enmity of Strafford, and afterwards lived in retirement, taking no active part in the war. V. himself, after a thorough education at Westminster and Magdalen College, Oxford, where already his heterodox views began to make themselves apparent, went abroad and remained for some time in France and at Geneva, where he contracted views strongly opposed to the Anglican form of church government and the monarchical form of temporal power. Returning to England, he found that his opinions exposed him to much ill-will and unpleasantness at the hands of his father as well as from strangers, and he consequently determined to emigrate to America. He landed in New England in 1635, and his ability and strength of character were already so marked that he was almost at once elected Governor of Massachusetts. He seems, however, to have been yet more independent and republican than the independent and democratic colonists, for he held office little more than a year, and returned to England in 1636. He now married, and was partly, at least, reconciled to his father, who procured for him the office of Treasurer of the Navy in conjunction with Sir William Russell. In 1640 he was knighted and sat for the borough of Hull in the Parliament of that year, as well as in the Long Parliament which assembled in November. He was now sole Treasurer of the Navy, and the fees of his office amounted, it is said, to nearly £30,000 a year, all of which he resigned to Parliament, stipulating only that £2000 a year should be continued to his deputy. In Parliament he was one of the most vigorous opponents of Laud and Strafford, especially of the latter, against whom he was embittered by family hatred as well as political resentment. He was one of the commissioners sent to Scotland in 1648, and became a member of the Council of State in the following year, rising to the office of president in 1652. He was in no way directly concerned in the execution of Charles I., though his moderation in this respect stood him in little stead afterwards. His Republicanism was far too sincere and thoroughgoing to permit of his acting in concert with Cromwell. When the Protector forcibly dissolved the Long Parliament in 1653 he openly attacked V. as 'a juggling fellow,' and the latter became a consistent opponent of his usurpations. A pamphlet called *A Healing Question Propounded and Resolved*, which he published in 1656, led to his imprisonment for some time in Carisbrook Castle, which did not, however, deter him from continuing resolutely to oppose the government both of Cromwell and of his son Richard. On the latter's abdication V. was again for a short time in the ascendant, and became a member of the Committee of Public Safety and of the Council of State, of which he was ultimately president. But as Parliament began to tend more and more towards monarchism his star waned, until at length he was ordered to repair to his estate of Raby Castle and remain there during the pleasure of the Government. The Restoration found him still in this retirement, and, trusting to the general amnesty declared for all who had not been actively concerned in the execution of Charles I., he did not attempt to escape. A special exception, however, was made in his case, he was seized (February 1660), imprisoned in the Tower, and afterwards moved from prison to prison, being one time taken as far as the Scilly Isles. At the commencement of his imprisonment Parliament had petitioned that whatever punishment might be awarded him his life should be spared, and the king had to all appearance acceded to the petition. Nevertheless, a rising of the Fifth Monarchy party with which he had been connected (January 1661) led to increased rigour against him, and he was ultimately brought to trial. He defended himself boldly and ably, but was sentenced to be hung, drawn, and quartered at Tyburn, which sentence was afterwards altered by a special act of grace, and he was beheaded on Tower Hill on the 14th of July 1662. He published several works on politico-religious subjects full of the obscure mysticism which characterised his views on religion. He had actually a sect of disciples called by Burnet *Seekers*, and by Baxter *Vanists*. See *The Life and Death of Sir Henry Vane, Knight* (Lond. 1662).

Vanill'a, a small genus of *Orchidaceæ*, natives of tropical America and Asia, and distinguished from most other orchids by their climbing habit. The twining, four-angled, somewhat succulent stem ascends trees to a height of from 20 to 30 feet, producing oblong fleshy leaves and throwing out roots at the nodes. The flowers are dull-coloured. V. is unique among *Orchidaceæ* in furnishing an article of commerce, the 'V. pods' used by perfumers, chocolate-makers, and confectioners being the fruit of *V. planifolia*, a native of Central America. The seed-vessel is cylindrical, with a diameter of about a third of an inch and a length of 8 inches. It is gathered before the seed is ripe, is dried in the sun, steeped in an oil, and made up into small bundles for export. V. has a strong peculiar agreeable odour and a sweetish aromatic taste. It acts as a gentle stimulant, and promotes digestion; in large doses it is considered to be a powerful aphrodisiac. It has been used medicinally in hysteria. The odorous principle, *vanillin*, can be made artificially, being the methylic aldehyde of pyrocatechuic acid, and is manufactured from the sap of *Coniferæ* as an article of trade. The plant is cultivated in the West India Islands, Ceylon, and Mauritius, but that from Mexico is most esteemed. Other species of the genus, as *V. Guianensis*, produce an inferior commercial V.

Vani'ni, Lucil'io (or, as stands on his title-pages, **Julius Cæsar**), owes his celebrity for the most part to his martyrdom in the cause of free thought. Born at Taurisano, near Otranto, in 1584, he studied at Rome, Naples, and Padua, and having joined the order of the Carmelites, wandered through Switzerland, Germany, the Netherlands, and France, preaching, teaching, debating, and attracting attention by his vivacious ability. From the threats of the Inquisition he fled to England; but, though he was admitted a member of the English Church by Abbot, Archbishop of Canterbury, his conduct was too independent for a proselyte, and for no other reason he was actually imprisoned in the Tower. On his release he went to France, where he published the two works by which he is still known—*Amphitheatrum Æternæ Providentiæ Divino-Magicum, Christiano-Physicum, Astrologico-Catholicum adversus veteres Philosophos, Atheos, Epicureos, &c.* (Lyon 1615), and *De Admirandis Naturæ Reginæ Deæque Mortalium Arcanis* (Par. 1616). His defence of Christian doctrine was supposed to be a mere pretext for the presentation of the counter arguments, and on the strength of some dubious passages he was accused of heresy, and in due course sentenced as an atheist to have his body burned and his ashes scattered to the four winds. His execution followed on February 19, 1619, and his memory has been blackened by the representatives of his clerical foes. In philosophy V. was an ardent follower of Averroes. See Schramm, *De Vita et Scriptis Famosi Athei J. C. Vanini* (Kustrin 1709); Arpe, *Apologia pro J. C. Vanini* (Rott. professedly Cosmopolis, 1712); Fuhrmann, *Leben und Schicksale des L. V.* (Leip. 1800); R. Palumbo, *Giulio Cesare Vanini e i suoi Tempi* (Naples 1878); and *General Sketch of the History of Pantheism* (Lond. 1879, vol. i.).

Vanloo', Jean Baptiste, a French painter, was born of a Flemish family at Aix, in Provence, 14th January 1684. His grandfather, Jakob (1614-70), was one of the best of Flemish colourists, and his father, Louis (1640-1712), gained the first prize of the Paris Academy. Entering the service of the King of Sardinia, V. subsequently studied at Rome, and at Paris was made a member of the Academy in 1731, and a Professor of Painting in 1735. He lost considerably in the Mississippi Scheme, and crossed in 1738 to London, where he became the fashionable portrait-painter of the time. He died at Aix, 19th December 1745. Besides excellent portraits, he painted many feebly ambitious, historical, and mythological subjects.—**Carle André V.**, brother of the preceding, born at Nice, 15th February 1709, was for some time a decorative painter in Paris, but took to portrait-painting. After visiting Rome, and executing a series of works for the King of Sardinia illustrative of Tasso's *Gerusalemme*, he settled in Paris in 1734, received the order of St. Michael in 1751, and was appointed chief painter to Louis XV. in 1762. He died at Paris, 15th July 1765. His works, which comprise decorations, portraits, mythologies, and religious subjects, are lacking in expression and genuine dignity, but are among the finest productions of French art under Louis XV. See Dandré-Bardon, *Vie de Carle V.* (Par. 1765); and A. Housaye, *Les V.* (*Revue des Deux Mondes*, August 1, 1843).

Vannes, the capital of the department of Morbihan, France, on the Marle, 32 miles S.W. of Rennes by rail. It consists of an upper and a lower town—the former, mostly new, slopes up a high hill, the latter consists largely of old wooden buildings forming crooked streets in the valley below. None of the

ancient buildings are of much interest. The cathedral of St. Pierre, burnt by the Normans, but rebuilt in the 13th and 14th centuries, and the Chateau de l'Hermine, a ruined tower in the centre of the town, are the chief. Several convents have been transformed into the government buildings. Among the public buildings are the bishop's palace, barracks, three hospitals, &c. There are manufactures of ironmongery, lace, calico, and other textile fabrics, paper, beer, and salt; also shipbuilding and fisheries. The trade consists in corn, sardines, hemp, butter, honey, wine, salt, wax, cider, and iron goods. There is a small harbour and canal leading to Morbihan bay. Pop. (1876) 15,716. V. was the ancient *Dariorigum Venetorum*. It was taken by Pippin the Frank in 753, and by the English in 1342.

Van Ren'sselaer, Henry Kilian, an American patriot of Dutch descent, was born at Albany, U.S., in 1744, commanded a regiment in the War of Independence, distinguished himself on several occasions, and in October 1777 aided in the actions which led to the surrender of Burgoyne. After the peace a famous mutiny broke out among his troops. He died at Greenbush, New York, 9th September 1816.—**Solomon V. R.**, son of the preceding, was born 9th August 1774, had a distinguished military career, shared in the brilliant attack on Queenstown Heights, 13th October 1812, and died at Albany, 23d April 1852.—**Stephen V. R.**, 'the patroon,' was born at New York, 1st November 1764, graduated at Harvard 1782, was member of State-senate 1790–95, Lieutenant-Governor 1789–1801, and from 1810 a leading Commissioner for the Erie Canal Scheme. In 1812, as a colonel of militia, he led the attack on Queenstown. In 1819 he was made Regent of New York University, and subsequently instituted the geological survey of New York, and founded the Troy scientific school. In 1824 he published the *Geological and Agricultural Survey of the District adjoining the Erie Canal.* He died at Albany, 26th January 1830.

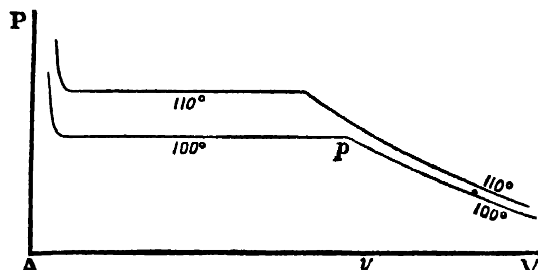
Vanucci. See PERUGINO.

Van Veen or **Ve'nius, Otho**, a Dutch painter, born at Leyden about 1556, studied under Zucchero at Rome, and was the first who explained the principles of chiaroscuro to Flemish artists. He was invited by the Emperor Ferdinand II. to settle in Vienna, but returned to Holland and served the celebrated Alexander Farnese, then Governor of the Spanish Netherlands. On the death of his patron he opened an academy at Antwerp, where Rubens was among his pupils. He was appointed Master of the Mint at Brussels, and subsequently declined the invitation of Louis XIII. to visit Paris. He died at Brussels in 1634. V. was an able painter of allegories and religious groups, but is chiefly remembered as 'the master of Rubens' (*Reynolds*).

Vap'ereau, Louis Gustave, a French littérateur and editor, born at Orléans, April 4, 1819, won (1838) the prize for philosophy in a competition between all the colleges of France, became private secretary (1842) to Victor Cousin, whom he assisted in his *Pensées de Pascal*, and after spending some years as a professor in a college at Tours returned to Paris, where he passed *avocat* (1854), but devoted himself to literature. His best-known work is the *Dictionnaire des Contemporaines* (1st ed. 1858; new ed. 1870), which is equally admirable for the fulness of its knowledge and the felicity of its criticism. Since 1859 V. has issued yearly *L'Année Littéraire et Dramatique*, an annual review of the chief products of the national literature. Another important work of V.'s is his *Dictionnaire Universel des Littératures* (Par. 1876).

Va'pour is generally understood to mean the gaseous form which a solid or liquid substance assumes when heated. It is therefore essentially a gas; and now that all known gases have been liquefied, there is no physical difference between an ordinary gas such as oxygen and a V. such as steam. By Rankine, however, the term is used in a restricted sense; and in this connection we propose to consider it now, referring to GASES for the general laws which more or less approximately hold for all bodies in the gaseous condition. The effect of heat upon a liquid is fourfold. It may warm the liquid, *i.e.*, raise its temperature; it may alter its volume; it may alter its physical state as a liquid, *i.e.*, make it more or less mobile; and it may convert it into V. This last phenomenon, *evaporation*, takes place with most liquids, and even with many solids, at ordinary temperatures, as is evidenced by the gradual decrease in quantity of water exposed to the open air, or by the smell which many substances possess. If a liquid partially fills a vessel from which air has been exhausted, it is found that the vessel becomes filled with vapour, the density of which depends only upon the temperature. If the remainder of the vessel contains any quantity of air or other gas not capable of chemically acting upon the liquid, exactly the same quantity of V. will be formed, only the time taken by the V. in attaining its maximum density will be greater. These laws of evaporation were discovered by Dalton, and show that for every V. in contact with its liquid or solid there is a maximum density which the V. has at that temperature. Hence, for each temperature there is also a maximum pressure which the V. can exert, since in all substances the density, pressure, and temperature are so connected that given any two the third is also determined. A V. at its maximum density and pressure corresponding to its temperature is called *saturated* V.; and in this sense only does Rankine employ the word V.

Consider now a cylindrical vessel with a tightly-fitting movable piston, and filled with steam at 100° C. Also let the volume of the steam be such that its density is considerably below the maximum density of saturation corresponding to that temperature. If, in these circumstances, the piston is pushed in, the volume is diminished and the density and pressure proportionately increased. Throughout the operation we shall suppose the temperature to remain constant, so that, since steam behaves nearly the same as an ordinary gas provided it is not near its saturation point, the product pv (pressure × volume) is approximately constant. Hence, if we measure lengths representing volumes along the horizontal axis AV, and corresponding co-ordinates in the direction of AP drawn vertically, we shall be led to the



construction of a curve or *isothermal line*, expressing the relation between pressure and volume. This curve is approximately an hyperbola until the volume of the steam is so diminished that the pressure approaches the maximum point of saturation—until, in other words, the steam becomes V. in the restricted sense explained above. Let AV represent the volume, the corresponding pressure for which (vp in the diagram) is this maximum pressure of saturation; then any subsequent diminution of volume is accompanied by the condensation of the saturated steam as water at 100° C., and *there is no increase of pressure* as long as there is steam to condense. The isothermal line expressing the relation between pressure and volume will therefore be a straight line parallel to AV the line of volumes. When at length the steam is wholly condensed as water, any further diminution of volume is attended with a very great increase of pressure, so that the isotherm is then continued abruptly up towards P, as represented roughly in the diagram. If the same series of experiments be made when the substance is kept at a temperature of 110° C., the same peculiarities present themselves, except that the pressure of saturation is greater and the corresponding volume less than in the former case. The isotherm of 110° may be represented by a similar but higher curve, in which the break indicating the point of saturation takes place at a smaller volume but greater pressure. In this way a number of isotherms may be drawn; and it is found the higher the temperature the smaller becomes the straight portion of the line. Hence it is conceivable that for a certain high temperature this straight portion will disappear and the isotherm will become a continuously curved line. This *critical temperature*, as it is called by Andrews, has not been experimentally obtained for water, but it has been very thoroughly investigated by this distinguished physicist for carbonic acid. As early as 1822, Cagniard de la Tour observed that when liquids were strongly heated

in glass tubes of a capacity not much greater than the volume of the liquid, there was a certain temperature for which the substance hitherto partly gaseous and partly liquid suddenly assumed a uniform appearance. He concluded therefore that at this temperature the whole became gaseous, though the volume was very little greater than the original volume of the liquid. The true explanation was given by Andrews, who showed that the properties of the liquid and gas approach similarity as the temperature is raised, and that above a certain temperature they were not distinguishable. This result fully accords with Faraday's statement, that above a certain temperature peculiar to each gas no amount of pressure will produce the phenomenon we call condensation. By a series of elaborate experiments upon carbonic acid Andrews showed that the isotherm for 48·1° C. was a perfectly continuous curve, while that for 20·5° C. presented the broken characteristics we have described as belonging to the steam isotherm for 100° C. The isotherm for 31·1° C. just escapes having this characteristic, and therefore lies just above the critical temperature. We thus see that the properties of a gas may imperceptibly pass into those of a liquid without any break of continuity, so that the gaseous and liquid states are only widely-separated forms of the same condition of matter. The critical temperatures of most liquids are very high, so that their determination is difficult and dangerous, while the critical temperatures of the so-called permanent gases are very low, and have only lately been reached experimentally. For a fuller discussion of these curious relations between liquids and their vapours, see Clerk Maxwell's *Theory of Heat*.

Var, a department in the extreme S.E. of France, named from the river V. Area 2349 sq. miles; pop. (1876) 295,763. In the N. and N.E. it is mountainous. The chief rivers are the Gassau, Argens, and Loup. The soil is for the most part extremely fertile, though about 620,000 acres are still forest. The olive and the vine are its chief products, but the silkworm is also largely bred, and tobacco, oranges, wheat, and potatoes form important items in its returns. In 1876, 73,766,000 gallons of wine of all sorts were produced, 433 tons of silk cocoons, 242,000 qrs. of wheat, 2,640,000 bushels of potatoes, and 61,600,000 lbs. of olive oil; while in 1875 the coal production amounted to 83,500 metrical quintals. The capital is Draguignan (q. v.); other towns are Toulon (q. v.), Brignoles (q. v.), and Frejus (q. v.).

Varan'gians (Old Norse *Væringjar*, from *vár*, 'oath,' Gr. *barangoi*), a body-guard of Northmen first employed by the Greek emperors at Constantinople about the beginning of the 10th c., and who for centuries upheld the Byzantine throne. They were bound by an oath to the emperor, and subject to a strict military code. They were stationed at Kibotus near Hellenopolis on the Hellespont, where they were afterwards reinforced by the Ingloi, refugees who had fled from England before its Norman conquerors. At the death of the emperor they had the privilege of carrying off what they would from the imperial treasury. Traces of these V. or 'Warings' are seen in the Norwegian *Varenge-fjord*, *Wieringergaard* on the Dutch coast, *Varengeville* in Normandy, and the names of many places in England. See NORTHMEN, and the works there mentioned.

Vara'nus, an important genus of *Lacertilia* or lizards, including the 'Monitors,' so named from the belief that they warned persons of the approach of crocodiles by a peculiar hissing noise. The family *Varanidæ* are represented by some of the largest members of the lizard group. They are found in Asia, Africa, and Australia. The *V. Niloticus* of Egypt attains a length of from 4 to 6 feet, and the *Hydrosaurus sulcator* of the East Indian Archipelago occasionally 8 feet. The head and belly are covered with small scales, and the tongue is protrusible and fleshy. The teeth are lodged in a common groove, and there are no palatal teeth. The tail is compressed in the water-living species, and has a double row of carinated scales.

Varaz'ze, or **Voragine** (Lat. *Vicus Virginis*), a small town of N. Italy, province of Genoa, on the gulf of Genoa, 20½ miles distant by rail from the city of Genoa, has obtained of late some note as a shipbuilding place, mostly for the Genoese merchant service. Portions of the old fortifications are still standing, and in the Church of S. Ambrosio of the 12th c. there are some fine marbles and pictures. Besides the shipbuilding yards, in which 17 vessels were built in 1874, the town contains paper-mills and one or two cotton factories. Anchors, nails, cordage, and paper are manufactured. Pop. (1874) 9179.

Vare'se, a town of N. Italy, on a lake of the same name, 37½ miles N.N.W. of Milan by rail. The church of San Vittore (1567), with a tower 246 feet high, contains some good pictures, and several of the private villas, belonging for the most part to Milanese families, are extremely handsome. The sanctuary of Madonna del Monte, 8¼ miles N.W., commands a magnificent view. Silk and paper are the chief manufactures, but there are also large establishments for the making of furniture and smaller ware. Pop., with suburbs (1874), 12,605.

Varia'tion, in music, the rendering of the principal air or theme of a composition in a different manner, by changes in time, rhythm, or key, and harmonic and contrapuntal embellishments. It forms a useful exercise for the student, and has been a favourite subject even among the greatest masters, such as Mozart and Beethoven, giving great opportunity for ingenious and imaginative treatment.

Varia'tion of the Com'pass. See TERRESTRIAL MAGNETISM.

Varia'tions, Cal'culus of, an important branch of the differential calculus, was first systemically developed by Lagrange in 1760. Previous to this, the two Bernoullis had successfully attacked several problems which require the peculiar methods of the C. of V. for their solution. The first problem proposed by John Bernoulli was to find the *brachistochrone*, or the curve of quickest descent from one point to another under the action of gravity. The problem is one of maxima and minima, but its peculiarity as distinguished from problems solvable by the ordinary method of the differential calculus is, that not only must account be taken of variation of position *along* any one possible path, but also of variation of position in passing from one path to a contiguous one. There are thus two distinct kinds of differentiations to be treated, and the latter is distinguished as variation, and the symbol used δ, to avoid confusion with the d of the ordinary differential calculus. To find the curve which with given perimeter encloses the greatest area is a problem of the same nature as the brachistochrone problem, and was solved by the Bernoullis. Euler added much to our knowledge of the methods, which are now very much as Lagrange left them. Though its development is thus mainly due to the Continental mathematicians of last century, it must be noted that the first who solved a *variation* problem was Newton, who, in the scholium to the 34th proposition of the second book of the *Principia*, gives, without in any way indicating how he obtained the result, the construction for finding the form of the solid of least resistance moving in a resisting medium. See Jellet's *C. of V.* (1850); Strauch's *Theorie und Anwendung des Sogenannten Variationskalculs* (1850); Airy's small treatise, and Todhunter's *History of the C. of V.* (1860).

Varicell'a (Lat. 'a little pimple') is a disease popularly known as Chicken-pox (q. v.).

Var'icocele, or **Cir'cocele**, is a term used in surgery to denote a varicose condition of the pampiniform plexus of veins which returns the blood from the testicle into the spermatic vein. V., in its minor degrees, is a very common affection, and, in most cases, neither operative nor palliative treatments are necessary. When the V. is large, nothing is required but a bag-truss. If the enlarged veins should inflame, rest in the recumbent position, with the testicles raised by a small pillow, fomentations and leeches are indicated. In very severe cases operative interference has been found necessary, the operation being the same as for varicose veins of the leg.

Var'icose Veins, or **Va'rix**, is a very common affection as seen in the veins of the lower limb. It sometimes affects the veins of the spermatic cord, constituting the disease called Varicocele (q. v.); and the hæmorrhoidal veins, giving rise to Hæmorrhoids or Piles (q. v.). When any large trunk-vein is obliterated, the collateral circulation is frequently carried on by the subcutaneous veins, which consequently become dilated, tortuous, and varicose. V. V. in the lower extremities may be caused by

too great or too continuous a strain on the veins, or by any obstruction to the return of blood from them, the special causes being long-continued standing, especially in a heated atmosphere, too firmly applied garters, ill-fitting trusses, abdominal tumours, the gravid uterus, and relaxation of the tissues which should support the veins. The first stage of the disease is dilatation, which if long continued may become permanent. In consequence of the dilatation the valves become inadequate to close the vessel, and the pressure is transmitted to a lower part of the trunk, which becomes similarly affected. A considerable tract of the vein becomes tortuous and enlarged, constituting the condition called V. V. In the second stage of the disease the coats of the veins which are probably thinned by long-continued dilatations may give way altogether, and the skin over them being absorbed by the pressure may also give way, hæmorrhage being the result. In some cases, however, thickening of the veins is the result. The retardation to the return of the blood may cause, in addition to dilatation, congestion, exudation of serum, low inflammation, and ulceration, giving rise to varicose ulcers. The superficial veins are chiefly affected, but the deep veins may suffer similarly; indeed, Giacomini, a recent writer, asserts that varicosity of the superficial veins is always secondary to a varicose state of those deeper veins (inter- and intra-muscular) which establish a communication between the trunk veins accompanying the arteries and the subcutaneous vessels—the radicles of the saphenous. The *treatment* of V. V. may be palliative or radical. In the early stage complete recovery may ensue by removing the exciting cause, unloading the veins by rest in the raised posture, and by improving the tone of the tissues. The patient should remain in bed for a considerable time, and the affected limb should be elevated above the level of the body. If subacute inflammation is present, hot emollient fomentations should be applied; but if there is only œdema, a soft firm bandage should be applied. This mode of treatment, conjoined with the improvement of the general health, will at least relieve the more urgent symptoms, and may, if persevered in for a sufficient length of time, say a month, result in a radical cure. As there is always a tendency to a relapse, the patient should afterwards wear a well-fitting elastic stocking or a bandage, more particularly during any strong exercise. The indiarubber bandage, carefully applied, will be found to answer the purpose well, even in cases of long standing, when the veins have become much thickened.

The following is the mode of operation for the radical cure of V. V. introduced at St. George's Hospital by Mr. H. Lee. Two pins are to be passed under the vein at a distance of about an inch from each other. Compression is then made by twisting a figure-of-8 ligature round the pins or by a piece of indiarubber, through which the pin is thrust before it is introduced, and which is then drawn over its points. Then a thin knife is passed under the vein, and the latter completely divided without cutting the skin. Two or three circular pieces of plaister encircling the whole leg are then firmly applied over the puncture and the divided ends of the vein; and the patient is kept in bed, with the limb raised, for a week or ten days. The pins are removed one at a time within from two to five days. The plaister need not be removed unless suppuration is found to be going on. When the parts have healed, an elastic stocking should be worn.

Vari'ety (1) in *Natural History*. When a *species* of animals *varies*, and produces individuals which differ in certain points, such as size, colour, &c., from the specific type, these aberrant individuals constitute *varieties* of the species. Thus a white or albino elephant is a 'V.' of the ordinary Indian species. The causes of *variation* in animals and plants are obscure—change of food or climate being obvious external causes, while many undetermined and internal causes of variation also exist. It may be noted that variation is the literal keynote of Darwinism and other theories of organic evolution. (2) In *Botany*. When a large number of the individuals of a *species* differ from the others in any striking particular they constitute a V. If the V. generally comes true from seed, it is often called a *race*. A V. can only be propagated with certainty by grafts, cuttings, bulbs, tubers, &c. A race may with care be propagated by seed. A real species will always come true from seed.

Vari'nas, or **Bari'nas**, capital of the province of Zamora, or V., Venezuela, on the San Domingo, 290 miles S.W. of Caracas. It was formerly a considerable town, and manufactured great quantities of the V. tobacco. This industry was greatly interfered with during the civil war, and V. now exports chiefly coffee, cocoa, and cattle. Pop. (1873) 3950.

Var'na, the chief Black Sea harbour of the principality of Bulgaria, situated on a crescent-shaped bay, at the mouth of the Paravadi, to the S. of Cape Kaliakra, and 170 miles N.N.W. of Constantinople, with which it has communication by regular steam lines. It is the terminus of the railway from Rustchuk, constructed in 1866, and is girt by a high wall and a deep ditch, while strong batteries command both town and harbour. The seat of a Greek metropolitan and the residence of several foreign consuls, V. has, besides a citadel, several mosques, large storehouses, a lazaretta, &c. The harbour is exposed to S.E. winds: on Cape Galata, on the S. of the bay, stands a lighthouse. In 1873 there entered the port 659 vessels of 216,963 tons, and cleared 655 of 216,303 tons. The exports in the same year (cereals and live-stock, including 30,067 sheep) amounted to 13,426,850 fr., and the imports (manufactured goods and colonial produce) to 11,179,272 fr. Pop. 10,000, mostly Greeks and Bulgarians. Near V. the Turks defeated the Hungarians with great slaughter, 10th November 1444. The Russians took it in 1828, and the French and English Allies encamped here for four months before sailing for the Crimea in September 1854. V. was included in Bulgaria by the Berlin Treaty, in terms of which it is to be dismantled along with the other forts of the principality. After the conclusion of the definitive Russo-Turkish treaty in February 1879, V. was a chief port for the embarkation of the Russian troops.

Varnha'gen von Ense, Karl August, born at Düsseldorf, 21st February 1785, passed his boyhood at Hamburg, where his father practised as a medical man. He studied medicine himself, but with it philosophy and ancient literature, at Berlin hearing Fichte and A. von Schlegel, at Halle Schleiermacher, Wolf, and Steffens. With Chamisso he edited a *Musenalmanach* in 1803, the year of his meeting Rahel, with whom, on removing to Tübingen in 1808, he maintained by voluminous letters the friendship of the past five years. Entering the Austrian army (1809), he was wounded at Wagram, and visited Paris as Bentheim's adjutant in 1810; but in 1812, on Austria's joining in the Russian campaign, quitted her service, and next year accepted a captain's commission in that of Russia. Exchanging a career of arms for that of Prussian diplomatist, he married Rahel, 27th September 1814, and having attended the chancellor Hardenberg to the Vienna Congress, and thence to Paris (1815), settled at Karlsruhe as resident minister. In 1819, however, a variance with his government recalled him to Berlin, where, busy with literature and bearing the empty title of *Geheim-Legationsrath*, he chiefly resided down to his death there, 10th October 1858. A graceful poet of the Romantic school, a subtle critic, and masterly biographer, V. ranks with the first prose-writers of Germany for polish and style, so polished indeed as sometimes to lose all character, while its matter is often marred by a narrow misanthropy, engendered by his exclusion from public life. Chief of his manifold works are *Deutsche Erzählungen* (1815), *Vermischte Gedichte* (1816), *Goethe in den Zeugnissen der Mitlebenden* (1823), *Biographische Denkmale* (5 vols. 1824-30), and *Denkwürdigkeiten und Vermischte Schriften* (9 vols. 1843-59). Over twenty volumes of diaries and correspondence have been published from his posthumous papers, and his *Ausgewählte Schriften* (Leip. 1871-77) fill nineteen more.—V.'s wife, **Rahel Antonie Friederike Levin**, the daughter of a Jewish merchant, was born at Berlin in June 1771. Ill-health, and love affairs made hopeless by the stigma of her birth, saddened her earlier years, though hers was brightest of all the Jewish *salons*, the focus then of Berlin's intellect. Courted by all the chief authors, artists, and statesmen of those disordered times, she exercised by her broad sympathies and liberal culture a lively influence on the German mind; but in 1806 she left Berlin to wander awhile in France and Germany. The death of Marwitz at the battle of Montmirail (1813) removed V.'s rival in her affections; and Rahel, turning a Christian less from conviction than convenience, entered upon a union of pure and singular happiness, closed by her death at Berlin, 7th March 1833. V. published *Rahel, ein Buch des Andenkens für ihre Freunde, Briefe enthaltend* (2d ed. 3 vols. 1834), and *Gallerie von Bildnissen aus Rahels Umgang und Briefwechsel* (2 vols. 1836), since which has appeared her correspondence with David

Veit (2 vols. 1861) and with V. himself (6 vols. 1874–75). See also Schmidt-Weissenfels, *Rahel und ihre Zeit* (1857); L. Assing, *Aus Rahels Herzensleben* (1877); Carlyle, 'Rahel and V.' in vol. vi. of his *Collected Works;* and Mrs. Jennings, *Rahel, her Life and Letters* (Lond. 1876).

Var'nish is a clear transparent solution of some resinous substance, which when spread in thin coatings over any body dries and hardens, forming a smooth glossy surface impervious to air, and unaffected by moisture. V. is therefore an important substance for at once giving lustre and gloss, and for preserving the substance of paintings, painted work, woodwork, maps, plans, and to some extent metallic surfaces, &c. The resinous bodies chiefly used for varnishes are copal, animé, lac, elemi, mastic, sandarach, and amber, which may be coloured with such substances as anatto, gamboge, saffron, aloes, turmeric, or dragon's blood. The solvents with which these substances are made into varnishes are either drying oils, with which oil V. is made, or alcohol about 67° over proof, giving spirit V. Spirit V. is prepared by dissolving the resinous material under the influence of heat in methylated spirit of the strength above indicated, care being taken to prevent loss by evaporation. Oil V. is commonly prepared with the finest boiled linseed oil, which is added hot to the resin previously molten by heat, and to this hot spirit of turpentine is added. As an example of proportions used, the following recipe for body V. may be given:—Pure copal, 8 lbs.; boiled oil, 2 gallons; spirit of turpentine, 3½ gallons. This, when prepared as indicated, strained and cooled, forms a hard, clear, and durable V. See Bersch, *Fabrikation der Mineral und Lack-farben* (Vein. 1878).

Var'nish Tree, a name applied to several trees yielding a juice from which a varnish is prepared in different countries. Many of these trees belong to the natural order *Anacardiaceæ*, and the most important have already been mentioned under Melanorrhœa and Sumach. Another, named Sylhet V. T. (*Semecarpus Anacardium*), furnishes a black varnish much used in India, and its juice, mixed with lime-water, serves for marking cotton. New Granada V. T. is *Elæagia utilis*, belonging to *Rubiaceæ*. In this the resinous matter from which the varnish is prepared is secreted by the stipules which invest the unexpanded buds.

Varr'o, Mar'cus Teren'tius, 'the most learned of the Romans,' a title which he merited by his vast and various knowledge, was born at Reate, B.C. 116. His education was superintended by the knight Præconius and the philosopher Antiochus. He engaged in public life, and espoused the cause of Pompey, but after the battle of Pharsalia (B.C. 48) he submitted to Cæsar, who appointed him keeper of his library. Under the second triumvirate he was proscribed, along with his friend Cicero; but, unlike the great orator, he escaped with his life. He afterwards obtained the favour of Octavianus, and passed the remainder of his days in uninterrupted literary labours. He died B.C. 28. V. wrote a large number of books on a great variety of subjects. Of the majority of these we only know the names. The chief are—1. *De Re Rustica*, a methodical treatise on agriculture, in three books, of which the third alone is extant. 2. *De Lingua Latina*, a philological dissertation, in 24 books, of which 6 (5–10) remain. This work contains much curious and valuable information, ingenious conjecture, and wild theorising. 3. *Sententiæ*, a collection of pithy and proverbial sayings excepted from the works of V. 4. *Antiquitatum Libri*, consisting of (1) *Human Antiquities*, in 25 books, an account of the creation, constitution, and early history of man, and (2) *Divine Antiquities*, in 16 books, 'a complete account of the mythology and rites of the inhabitants of Italy from the most remote epoch.' We only possess a few fragments of this treatise. In addition V. wrote satires and works on history, biography, philosophy, geography, and mathematics, which we know only from notices by other writers. See Roth's *V.* (Basel 1857), and Boissier's *Essai sur la vie et les ouvrages de Varron* (Par. 1861).

Varu'na ('the investing,' from the same root as the Gr. *ouranos*), one of the earliest gods of the primitive Sanskrit mythology, whose image is still worshipped in Hindu temples. Though originally the god of heaven and of day, he has now come to be regarded as the deity that presides over the ocean—the waters which have left the air and rest on the earth. See Dr. A. Hillebrandt, *V. und Mitra* (Breslau 1877).

Va'rus, Pub'lius Quintil'ius, was consul (13 B.C.), acquired enormous wealth as proconsul of Syria (6 B.C.), where he suppressed a rising of the Jews. Entrusted with the command of the Roman forces in Germany (6 A.D.), he was leading three legions through a pass in the Teutoburger Wald, when Hermann (q. v.) fell on him with a barbarian host, and after a three days' conflict annihilated the Roman troops. V. himself committed suicide. Suetonius (*Aug.* cap. 23) tells us that Augustus was overwhelmed by the news of the disaster, and in his grief called on the dead man to give him back his legions.

Va'sa, a family which held the throne of Sweden (q. v.) from 1523 to 1654 in the persons of Gustaf I. (q. v.), Erik XIV. (q. v.), Johan III. (1568–92), Sigismund (q. v.), Karl IX. (q. v.), Gustaf II. Adolf (q. v.), and Queen Christina (q. v.). The name of V. has in recent times been claimed by the son of the deposed king Gustaf IV. Adolf (q. v.), Prince Gustaf of Holstein-Gottorp, who was born in 1799, and died at Pillnitz, August 4, 1877.

Vas'arhely or **Hod'mező-Vas'arhely**, a town of Hungary, in a marshy plain near the left bank of the Theiss, 94 miles S.W. of Grosswardein by rail, with an active trade in tobacco and live stock. Pop. (1870) 49,153.—**Maros-V.**, a town of Hungary, capital of the Szekler district in Transylvania, on the Maros, an affluent of the Theiss, 37¼ miles E.N.E. of Kocsard by rail, with a strong castle, a library of 60,000 volumes (founded by Count Tökely), and a large trade in tobacco, wine, and fruits, the produce of the surrounding country. Pop. (1870) 12,678.

Vasa'ri, Giorgio, an Italian painter, architect, and author, was born at Arezzo in 1512. He studied under Michael Angelo, and was employed by various members of the Medici family in the superintendence and decoration of their buildings. He died at Florence, 27th June 1574. The Uffizi at Florence and the Abbadia at Arezzo are reckoned his achitectural masterpieces, and his 'Last Supper' at Arezzo, and his portraits of Cosmo I. and Lorenzo de Medici, are mentioned as favourable specimens of his pencil. But it is by his literary labours that he has made his name a household word to all time wherever the smallest interest is felt in the history of modern art. His *Vite dei più eccellenti pittori, scultori ed architetti* was the first important work on the subject, and however grievous are its omissions and mistakes, it has a freshness and naïveté that will always secure it a place in the history of art. It first appeared in 1550, and again enlarged in 1568. Among subsequent editions of the original, Bottari's (Rome 1759), Della Valle's (Siena 1791), Montani and Masselli's (Flor. 1832–38), and Le Monnier's (15 vols. Flor. 1846–57) rank high; but they will probably be superseded by that undertaken by Puri and Milanesi (8 vols. Milan 1878, *et seq.*). Milanesi has already published a volume of selected lives (3d ed. 1878). The complete work is translated into German by E. Forster and Schorn (Stutt. 1832–38), into French by Jeanron and Leclanché (Paris, 10 vols. 1840–42), and into English by Mrs. Jonathan Foster (Lond. 1850; 5 vols. *Bohn's Standard Library*).

Vas'co da Ga'ma. See GAMA.

Vascular'es, or **Cotyle'doneæ**, are names of one of the great divisions in De Candolle's natural system, embracing all flowering plants, thus standing in opposition to his Cellulares or Acotyledoneæ.

Vas'cular Tiss'ue, the *vessels* or *ducts* of plants, so called from the mistaken notion that their functions are analogous to those of the vessels (veins and arteries) of animals. A *vessel* consists of a vertical row of cells, which have their transverse partition-walls obliterated, so as to form a continuous tube. As all flowering plants, as well as ferns and a few other cryptogams, have vessels, and are therefore called *vascular plants*, so the majority of cryptogams having only cellular tissue are termed *cellular plants*. Vessels have their sides very variously marked; some, called *spiral vessels*, have a spiral fibre coiled in their inside which unrolls when the vessel is broken; others are marked with longitudinal slits, cross bars, minute dots or pits, or with transverse rings.

Vase (Lat. *vas*), a term anciently applied to a vessel used at sacred or public ceremonies, or for domestic purposes, but now applied to a vessel used for ornament. All nations, ancient and modern, that have cultivated the arts, have displayed a taste for elegant and costly vases. The Egyptians, Greeks, and Romans

fashioned them from precious and other stones, bronze, silver, gold, ivory, and glass, as well as from clay, the material that was first employed. Greek vases of painted earthenware—numerous examples of which have been recovered from tombs within the last 150 years —display the perfection of form and artistic treatment; and in so far as the painted subjects have shed light upon the history, mythology, religious, civil, and domestic customs of that nation, they have proved of great value to antiquaries. These vases present a great variety of forms, always elegant, but in each case subordinated to usefulness. Those of the best period have figure subjects painted in a reddish colour, relieved by white, on a dark or black ground; while the archaic vases are small, with dark figures on the natural ground of the clay. The Romans formed their vases mostly on Greek models, and for excellence in variegated glass they have never been approached. The Portland V. (q. v.) and the 'Naples' V. in the Museo Borbonico at Naples are splendid examples of the remarkable artistic skill attained in sculptured cameo glass. The famed *vasa diatreta*, with an almost detached reticulated pattern, were worked out of the solid glass. Murrhine vases (*vasa murrhina*), which were first brought by Pompey to Rome from the East, were enormously valued. Nero, it is said, paid one million sestertii for a murrhine goblet. The material of these murrhine vases has not been precisely determined; most probably it was a kind of agate displaying red and purple colours, perhaps obtained artificially by heat, as is practised in India and Germany at the present time. Bronze was a favourite material for vases with the Romans, and one of the finest specimens of antique art is the 'Warwick' V., of marble, which was found at Tivoli, and is now in Warwick Castle. It is well known from its bronze electrotypes. Italy, France, and Germany, produced in the 16th and 17th centuries many vases in sculptured and enamelled gold-work, rock crystal, and other hard stones, which are the perfection of artistic form and execution; and in the 15th and following centuries the masterpieces of glass art (see GLASS), in the form of vases, &c., were issued from the manufactories of Venice. See Sir W. Hamilton, *Engravings of Ancient Vases* (Naples, 1791-95); Millin, *Peintures de Vases Antiques* (1818); Gerhard (E.), *Auserlesne Griechische Vasenbilder* (Berl. 1839-58); and *Die Griechischen Vasen in ihrem Formen- und Decorationssystem*, by Lau, Brunn, and Krell (Leip. 1877).

Vas'eline, a name given by Americans to a new commercial product obtained from petroleum after the lighter hydrocarbons are driven off, and composed of a mixture of paraffins. It is a pale yellow, translucent, semi-solid, crystalline body without taste or smell, does not become rancid, resists the action of most chemicals, is soluble in ether, not so in water or alcohol; and it is now widely employed as a base for ointments, pomades, cold cream, &c. V. is also useful for coating surgical instruments and steel surfaces generally to protect them from rust.

Va'so-Mo'tor Sys'tem, the name given to those nerve-filaments derived from the *Sympathetic system* of nerves (see NERVE and SYMPATHETIC SYSTEM), and which are distributed to the walls of the arteries. The V.-M. nerves thus exercise a very direct influence on the blood-circulation, and appear to originate in the grey matter of the *medulla oblongata*. Division of the V.-M. nerves of the abdominal blood-vessels causes dilatation, and effects comparable to those following severe internal hæmorrhage.

Vass'al (Fr., probably from Welsh *gwas-awl*, 'serving'), in Feudal terminology the correlative of Suzerain (q. v.), the V. being the holder of a fief from a superior lord. See FEUDALISM.

Vass'ar Coll'ege, 2 miles E. of Poughkeepsie, New York, was founded in 1861 by Matthew Vassar (1792-1868) for higher female education. A fine brick edifice, 500 feet long by 200 wide, it was erected at a cost of $200,000, and opened in 1865, its studies embracing the regular course of first-rate colleges, and the students receiving B.A. and M.A. degrees. In 1876 V. C. had a president and lady-principal, 9 professors (6 male) and 22 female teachers, 202 collegiate and 168 preparatory students, and 328 alumni.

Vassilkov', a town of Russia, government of Kiev, on the Stugna, an affluent of the Dnieper, 18 miles S.S.W. of Kiev. It has active manufactures of tobacco, soap, and tallow-candles, and a large trade in corn, cattle, and horses. Pop. (*St. Petersb. Cal.* 1878) 16,597.

Vas'to, a town of Italy, province of Chieti, on the slopes of a hill overlooking the Adriatic, 131 miles S.E. of Ancona by rail. Its cathedral has a Gothic façade, and in the town-hall is a small museum of relics and inscriptions. V. has trade in wine, vinegar, and oil. Pop. (1874) 13,797.

Vat'ican, The, the most extensive palace in the world, and, as the residence of the Pope, and the storehouse of valuable literary and art collections, one of the chief attractions of modern Rome. A building of the kind was erected on the Mons Vaticanus by Pope Symmachus about the year 300, near the anterior court of old St. Peter's, and it was rebuilt by Eugene III. and enlarged by Nicholas III. The V. did not, however, supersede the Lateran (q. v.) as the usual residence of the popes till their return from Avignon in 1377. The first conclave, held in 1378, resulted in the so-called Western Schism (see SCHISM). In 1450 Nicholas V., with the object of making the V. the most imposing of palaces, began the work of combining with it the residences and offices of the cardinals, and the small portion completed by him, afterwards occupied by Alexander VI., and named Tor di Borgia, was extended by subsequent popes. The Sixtine Chapel was erected by Sixtus IV. in 1473, and the Belvedere or garden-house by Innocent VIII. in 1490. Bramante (q. v.), under Julius II., united the latter with the palace by means of a great court, and constructed the Loggie round the Cortile die S. Damaso. By the erection of the library Sixtus V. divided Bramante's great court into two parts, the anterior court and Giardino della Pigna. The Pauline Chapel was the work of Paul III. (1534), and the present residence of the popes was completed by Clement VIII. (1592-1605). The labour of extending and adorning the V. was continued by Urban VIII., Pius VII., and Gregory XVI.; and even Pius IX., amid the revolutionary struggles of the 19th c., found time to enclose the fourth side of the Cortile di Damaso by reconstructing the great staircase forming the approach from the colonnade of St. Peter's. The palace now comprises 20 courts and some 11,000 halls, chapels, saloons, and private apartments. Chief among its great art-treasures are the Sistine frescoes of Michael Angelo and Raphael's Stanze and Loggie. The picture-gallery is one of the richest in Rome, and the collection of antiquities is the finest in the world, including extensive Egyptian and Etruscan museums, and comprising among its classical sculptures the Torso of Hercules, the Laocoon, and the Apollo Belvedere. The library now contains nearly 24,000 MSS., of which 17,400 are Latin, 3450 Greek, and 2000 Oriental; it also contains about 50,000 printed books, but of these only what formerly constituted the library of Cardinal Mai is catalogued and available for consultation. The archives are specially rich in documents relating to the Middle Ages, and comprise registers of the papal acts, letters of popes from Innocent III. down to Sixtus V. in 2016 vols., correspondence with nuncios and foreign nations, &c. The privilege of studying in the art galleries, curtailed since 1870, was extended by Leo XIII. in December 1878.

Vat'ican Coun'cil, the nineteenth œcumenical council of the Catholic Church, assembled at Rome, 8th December 1869, 719 prelates out of the 1037 invited having answered the summons of Pope Pius IX., and of this number 276 were Italians. Its decrees on the 'dogmatic constitution of the Catholic faith,' aimed at rationalism, were unanimously adopted, 24th April; but those on the 'dogmatic constitution of the Church of Christ,' *i.e.*, the decrees of Infallibility (q. v.), received (13th July) only 400 'placets,' against 60 'placets' *juxta modum*, and 88 'non-placets,' the last including Cardinals Rauscher, Schwarzenburg, and Mathieu, with Bishops Dupanloup, Strossmayer, and Hefele. On July 18, 110 recalcitrant prelates stayed away, and thus the Infallibility became a dogma by 533 affirmative against 2 dissentient votes. The council, having achieved its principal object, was indefinitely postponed, 20th October 1870, owing to the outbreak of the Franco-German War. See ROMAN CATHOLIC CHURCH; the recent works of Manning (q. v.), Newman (q. v.), and Gladstone (q. v.); and J. Friedrich, *Geschichte des Vaticanischen Konzils* (Bonn 1877).

Vattel', **Emmerich de**, a French jurist, was born August 25, 1714, at Couvet in Neuchâtel. Having studied at Basel and Geneva, and published a *Défense du Système de Leibnitz*

(Leyden 1741), he sought employment at the Prussian court; but his application being less successful than he had hoped, he removed to Dresden, and there he ultimately obtained a pension, was appointed the Elector's ambassador to the republic of Bern, and attained the rank of privy councillor. He died at Neuchatel, December 27, 1767. The work by which his name is best preserved is *Droit des Gens; ou Principes de la Loi naturelle appliqués à la Conduite et aux Affaires des Nations et des Souverains* (Neuchatel 1758, 2 vols.), being an exposition in the main of the doctrines of the great German jurist Wolff. It has been edited by Royer-Collard (2 vols. Par. 1830), by Chambrier d'Oleires (2 vols. Par. 1839), and by Pradier-Fodéré (3 vols. Par. 1863). Among the author's minor efforts are *Loisirs Philosophiques* (Dresden 1747); *Polyergie ou Mélanges de Littérature* (Par. 1757); *Amusemens de Littérature, de Morale, et de Politique* (Hague, 1765).

Vau'ban, Sébas'tian le Prestre de, Marshal of France, and the great military engineer of the *grand siècle*, was born, 15th May 1633, at St. Léger de Fougeret, Burgundy, of a noble but impoverished family. Left an orphan at an early age, he was educated by the curé of his village, from whom he received the only instruction in mathematics and mensuration he ever had. In 1651, at the age of seventeen, he joined the army of Condé, then in revolt against the royal authority, and soon distinguished himself by his gallantry as well as his marked turn for engineering. Taken prisoner, he was easily persuaded by Cardinal Mazarin to enter the royal service, and was appointed to a lieutenancy. In 1655 he received a commission placing him in the corps of engineers. From this date his fame rapidly and steadily increased. Under the command of Turenne, he directed the sieges of Landrecies, Condé, St. Ghislain, Mardyk, Gravelines, Oudenarde, and Ypres, and was rewarded by rapid advancement in the service. It is impossible to follow him through all his campaigns, and his more peaceful labours of defensive fortification. It has been calculated that V., in the course of his career, conducted 53 sieges, took part in 140 actions, constructed 33 new fortifications, and reconstructed the fortifications of 300 places. In many sieges he acted under the personal command of Louis XIV., whom he managed with much address, though without flattery or sycophancy. He was uniformly humane, regarding it as the duty of a general to avoid all useless expenditure of human life. Two great advances in the art of besieging attributed to V. are the use of *parallels*, which, if he did not invent, he developed and perfected, and the system of *ricochet firing* which he invented. The former he introduced at the siege of Maestricht in 1673, and the latter at the siege of Ath in 1697. He it was who carried out the gigantic system of frontier fortification, which so impoverished the treasury of Louis XIV., its cost being estimated by some at as much as £45,000,000, while others reduce it to about £8,000,000. It may be doubted, however, whether he himself approved this immense strategical and financial blunder. In 1676 he obtained the rank of lieutenant-general, and in 1703 was made Marshal of France. Towards the close of his life he occupied himself largely with political and politico-economical questions. He had the courage to present memorials both to Louvois and Madame de Maintenon recommending a restoration of the Edict of Nantes, and in 1689 he demonstrated the necessity of fortifying Paris. In a collection of fugitive pieces published under the title of *Oisivetés de M. de V.* (Par. 1843-46), he treats of both military and economical subjects, being among the first to recognise the importance of statistics in such inquiries. His treatise, called *Projet d'une Dîme Royale*, embodying proposals for reforms in government and taxation, conceived in the most liberal and progressive spirit, drew upon him the displeasure of the king, and very shortly afterwards he died at Paris, March 30th, 1707. His *Œuvres Militaires* were collected and published at Paris in 1796. See Carnot and Fontenelle, *Éloges*; Chambray, *Notice Historique sur V.* (Par. 1845); Poncelet's *Mémoire*, consisting of extracts from V.'s unpublished papers (Par. 1841-43), and above all G. Michel's *Histoire de V.* (Par. 1879).

Vaucluse', a department in the S.E. of France, bounded N. by Drôme, E. by Basses Alpes, and separated S. from Bouches du Rhône by the river Durance, and W. from Gard by the Rhone. Area, 1370 sq. miles; pop. (1876) 255,703. By the chain of Ventoux (6273 feet high) in the N.E., the Luberon Mountains (5656 feet) in the S.E., and the intervening V. Mountains (2132 feet), it is divided into three great basins, that of Orange in the N., that of Cavaillon in the S., and that from Avignon to Carpentras in the middle. The Rhone, with its tributaries, the Lez, Aigues, Louvèze, and Nesque, and the Durance with its affluent the Calavon and its great system of canals, abundantly water the soil, which is fertile, and favourable to the cultivation of the olive and the vine. Oats, maize, millet, potatoes, madder, and teasel are largely grown and exported. In 1875, 68,530 metrical quintals of coal were raised. The cultivation of the vine and the rearing of the silkworm are the principal occupations in the rural districts, but, in the towns, paper, chemicals, leather, pottery, soap, wax candles, hats, brandy, beer, liquorice, and confections are extensively manufactured.—The village of V. (Lat. *Vallis clausa*), from which the department takes its name, situated in a romantic, rocky valley in the V. chain, 18 miles E. of Avignon, is famous from having been the residence of Petrarch, who has celebrated its beauty in his sonnets. Near it is the fountain of V., the source of the Sorgues, a favourite haunt of the same poet, to whom a monument was erected here in 1809.

Vaud, Pays de (Ger. *Waadt, Waadtland*), a canton of Switzerland, surrounded by the cantons of Neufchâtel, Freiburg, Bern, and Valais, the Lake of Geneva, the canton of Geneva, and France. Area, 1244 sq. miles; pop. (1876) 244,352. It is a table-land between the Jura and the Bernese Alps, whose highest point in V. is Diableretz (10,663 feet high). It is crossed by Mount Jorat, which parts the basins of the Lakes of Geneva and Neufchâtel. The chief rivers are the Rhône, Saane, Orbe, and Broye. Cattle-rearing and the cultivation of fruit, vine, tobacco, flax, and hemp are the chief occupations. Watches, musical boxes, tobacco, and leather are manufactured. V. was taken in 1536 from Savoy by the canton of Berne, but freed itself in 1798, and in 1803 became an independent member of the Swiss Confederation. The present democratic constitution dates from December 15, 1861.

Vaude'ville, a word derived from Vaux de Vire, a village in Normandy, where Basselin composed a number of popular satirical songs. The term formerly meant a song of a lively turn and often of a topical nature, containing several couplets and a refrain; and from the introduction of such songs into theatrical pieces it has now come to signify a sparkling comedietta, interspersed with lyrics incidental to the story. The V. forms a favourite class of entertainment on the French stage.

Vau'dois. See WALDENSES.

Vaughan, Charles John, D.D., was born at Leicester in England, in 1810. From Rugby, where he was a pupil of Dr. Arnold's, he passed to Trinity College, Cambridge, graduated B.A. in 1838, became a fellow in 1839, and proceeded M.A. in 1841. As Chancellor's classical medallist he was in 1838 bracketed with Lord Lyttleton. In 1841 he became vicar of St. Martin's, Leicester, and from 1844 to 1859 was head-master of Harrow School, was appointed vicar of Doncaster, and in 1869 succeeded Dr. Robinson as Master of the Temple. In 1879 he accepted the deanery of Landaff. Dr. V. stands in high esteem for his fine spirit, his tireless activity, and his generous devotion to all the duties of his profession. Of the forty or fifty volumes which he has published, it is enough to name *The Personality of the Tempter and Other Sermons* (1851), *Epiphany, Lent, and Easter* (1860), *Epistle to the Romans, with Notes* (1861), *Lectures on the Philippians* (1862), *Christ the Light of the World* (1866), *Last Words in the Parish Church of Doncaster* (1869), *Half Hours in the Temple Church* (1871).

Vaughan, Henry, an English poet, distinguished by the self-adopted title of the 'Silurist' (*i.e.*, the Silurian, or native of South Wales), was born at Newton, near Skethrock, about 5 miles from Brecon, in the year 1621-22. Along with his twin brother Thomas he entered Jesus College, Oxford, in 1638. Their university course was disturbed by the Civil War; both were through family tradition keen royalists. Thomas at least took part in the conflict as a combatant, and Henry was sufficiently prominent to be imprisoned by the Parliamentarians. From Oxford Henry appears to have proceeded to London, and it was there that his first volume appeared in 1646—*Poems, with the Tenth Satyre of Juvenal Englished, by Henry Vaughan, Gent. Printed for G. Badger.* We next find him practising medicine at Brecon; and in 1647 he settled down at Skethrock as village doctor. Of his after life little is known except by inference. He appears to have suffered from serious illness and a 'peevish, inconstant state of health;'

and if Mr. Grosart's conjecture be right, he was bereaved of a youthful and deeply-loved wife. The religious instincts of his nature became so exceptionally developed that he regretted the innocent secularism of his early poems, and though he published four volumes of devotional pieces—*Silex Scintillans* (1650), *Mount of Olives* (1652), *Flores Solitudinis* (1654), and *Silex Scintillans, Part II.* (1655)—he left his profaner productions to their fate. Of these, however, one collection was made by his Oxford friends, *Olor Iscanus* (*i.e.*, the Swan of Usk, 1651), and another by his brother, *Thalia Rediviva* (1678). He survived till April 23, 1695. H. V. ranks high as a religious poet, and even to a purely secular reader he is not 'all stone and earth,' but, to use his own quaint phraseology, 'has shoots of everlastingness.' An avowed disciple of George Herbert, he indulges in similar conceits and perpetrates similar uncouthnesses, but none the less attains from time to time much beauty and charm both of thought and diction. His *Retreat*, for example, is no unworthy prototype of Wordsworth's *Intimations of Immortality.* A complete edition of V.'s works, both in prose and verse, occupies four volumes of Mr. Grosart's Fuller Worthies' Library (privately printed, 1871). A collection of his poems was published by the Rev. H. F. Lyte (1847), and reprinted by Bell & Daldy (1858).

Vaughan, Robert, D.D., was born in Wales in 1795, and received his theological education at Bristol College. After discharging the pastoral office for six years at Worcester, he was called in 1825 to an Independent Chapel in Kensington. From 1830 to 1842 he was professor of history in London University (now University College), and in 1842, on the removal of the Lancashire Independent College from Blackburn to Manchester, he was called to the presidency. Owing to failing health he resigned the post in 1857. He died at Torquay, June 15, 1868. V. was the principal projector of the *British Quarterly Review*, and editor from its commencement in 1845 till 1866. His principal works are *John de Wycliffe, D.D., a Monograph* (1853), previously published as *Life and Opinions of John de Wycliffe* (2 vols. 1828), *The Protectorate of Oliver Cromwell* (2 vols. 1838), *Essays on History, Philosophy, and Theology* (2 vols. 1849), *The Age and Christianity* (1849), and *Revolutions in English History* (3 vols. 1852-63). A pathetic interest attaches to his Memoir of his son, Robert Alfred Vaughan, originally prefixed to *Essays and Remains* (2 vols. 1858), and afterwards published separately in 1864. **Robert Alfred V.** was a young man of rare promise and attainment, who died in 1857 at the age of thirty-two. Of the literary power that was in him he has left proof in *The Witch of Endor and other Poems* (1844), and *Hours with the Mystics* (2d ed. 1860). See *Robert V., a Memorial* (Lond. 1869), and J. G. Rogers' *Pulpit Memorials* (Lond. 1878).

Vault (Old Fr. *volte;* from Med. Lat. *voluta*, 'something rolled'), in architecture, an extended arch; an apartment or a passage having an arched roof of stone or brickwork. There are several forms of vaults. A *cylindric, barrel*, or *wagon-headed* V. has a uniformly hemispherical concave surface; a *pointed* V. implies the use in construction of the pointed arch; and a *groined* V. is formed by the intersection of several vaults crossing each other at right angles. Barrel and pointed vaulting have been discovered in Egyptian tombs and Assyrian drains; and spherical or domical (see DOME) and groined as well as barrel vaults were constructed by the Romans. They introduced a groined V. formed by the intersection of two semi-cylinders of equal span; hence it is distinguished as *Roman vaulting.* Vigorous expression of strength is given to Norman vaulting by the introduction of massive *transverse* ribs (Fr. *arcs doubleaux*) on barrel vaults and *diagonal* ribs (Fr. *ogives*, from Lat. *augire*, 'to strengthen') on the groins of intersecting vaults; in late examples the ribs are decorated with zigzags and other ornaments. The pointed arch and groined V. are seen to perfection in Gothic architecture. Ribs run along the *ridges* of the main and cross vaults, in the Early English style, and *secondary diagonals*, and numerous small ribbings termed *liernes* (Fr. *lier*, 'to bind'), are found on Decorated and Perpendicular vaulted ceilings, which have a rich appearance of network. Ribs are exquisitely moulded and cusped, and pendants are not uncommon in Perpendicular vaults; and to the end of that style belongs the beautiful, exclusively English, form of vaulting, known as *Fan-Tracery* (q. v.).

Vault'ing Shaft, a pillar or shaft which rises from the ground, the capital of a pier or a corbel, and from which spring the ribs of a Gothic vault.

Vauque'lin de la Fres'naye, Jean, a French poet, born in 1535 at the château of La Fresnaye near Falaise, at the age of eleven composed *Foresteries* (Poit. 1555), a pastoral poem. He passed some years of nominal legal study at Poitiers, Paris, and Bourges, and was wounded at the siege of Saint-Lô, fighting with Matignon against the Huguenots. Henri III. appointed him lieutenant-general, and Henri IV. president, of Caen, where he died in 1607. V.'s *Œuvres* (Caen, 1605-12), graceful though frequently obscure, include the earliest French *Idillies* ('Idyls'), some sacred and political sonnets, and *Art poëtique, Satires*, &c. See J. Travers, *Essai sur la Vie et les Œuvres de V.* (Caen 1872).

Vauxhall' Gar'dens, a famous old London resort of pleasure, named from the manor of Vauxhall (Fulke's Hall), in which they were situated, the locality being in Lambeth, opposite Millbank. The New Spring Gardens, opened in May 1660, were, according to Pepys, 'mighty devertising.' They became very popular, to judge from Wycherley's allusions in 1672 and the comments of the *Spectator* in 1711. In 1732 they were opened by Jonathan Tyers for a 'ridotto al fresco,' and in 1833, their most successful season, they were visited by 133,279 persons, and the receipts amounted to £29,590. As many as 20,137 visitors attended on the single night of 2d August 1833. V. G. were closed in 1859, but their fun and follies live on in the pages of Thackeray's *Vanity Fair.*

Vav'asour (Fr. *vas-vassor*, by Pott derived from *vassus vassarum*, and so ultimately from the Cymr. *gwas-awl*, 'serving'), in the feudal system of the Continent, a vassal who held immediately of the higher nobility. In England the title was rarely used, though Camden defines it as next to Baron, while Chaucer applies it to his 'Frankeleyn,'—

'A shirreve hadde he ben and a counter,
Was nowher such a worthi *vavaser*.'

Vec'tor, in mathematics, is any directed quantity, and was first introduced as a fundamental conception clearly distinguished from that of mere magnitude by Sir W. R. Hamilton of Dublin in his calculus of Quaternions (q. v.). The simplest manner in which to represent such a quantity which involves both direction and magnitude is by means of a straight line in space; then the V. may be regarded as a *stepping* from one extremity of the line to the other. It then follows as an immediate consequence that, if we take any three points, A, B, and C, the step from A to C is equivalent to the step from A to B and the step from B to C taken in succession, a truth which is expressed in quaternion language thus—the V. AC is equal to the sum of the vectors AB and BC. The addition of vectors is therefore exactly the same process that has long been recognised in the composition of velocities and forces.

Ve'da (from the Sansk. *vid*, 'to know:' comp. Gr. *oida*, Lat. *videre*, Eng. *wit*), the term applied to the sacred books of the Hindus, or rather to that most ancient portion of them which is directly concerned with religious worship, being co-extensive with *Sruti* or revealed religion. The Vedas proper consist of four collections of hymns, (1) the Rig-V.; (2) the Yagur-V., subdivided into the Taittiriya and the Vajasaneyin; (3) the Sama-V.; and (4) the Atharva-V. Of these, the three last contain little more than extracts from the first, with a commentary that is admitted to be of comparatively recent date. They are of little interest to any but the professional Sanskrit scholar; but the Rig-V. deserves the attention of all cultivated persons, not only as being one of the most ancient books in the world, but also as representing the primitive forms of faith held by the common ancestors of the Aryan stock. The prefix 'Rig' (derived from the root *ric* or *rich*) means praise or celebration. Like the other three, the Rig-V. is divided into two distinct portions: a *sanhita* or collection of *mantras* or hymns of praise, and a *Brahmana* or code of *sutras* or ritualistic precepts. Of these again, the *mantras* are evidently by far the most ancient; and it is with them that this article will chiefly deal.

According to orthodox Hindu theory, all the Vedas alike are held to have been revealed, through sight no less than by hearing, to certain holy men called Rishis, who transmitted their divine knowledge by constant oral repetition to a succession of disciples.

Even at the present day few MSS. exist, and these of no great age or authority; in cases of disputed authenticity the regular appeal is to the memory of the *pandits* of greatest repute. Tradition relates that the existing recension is due to a mythical personage named Vyasa, who is also credited with the composition of the Hindu epics. It is only by the methods of modern criticism that we are enabled to assign even an approximate date to the composition of the Rig-V. Sanskrit literature itself is totally destitute of the historical sense. Internal evidence, based upon a comparison of the older with the later portions, and corroborated by such independent facts as the dispersion of the Aryan race and the historical rise of Buddhism, leads to the conclusion now generally accepted that the *mantras* of the Rig-V. were composed by a succession of poets between the 15th and 12th centuries B.C. Their general purport is praise of the personified elements of nature, combined with moral reflections. The chief gods addressed are Agni, or fire; Indra, or the watery atmosphere; Varuna, or the sky; Surya, or the sun; Ushas, or the dawn; and Maruts, or the storms. All of these are invoked to protect their worshippers from evil, and to grant them earthly blessings. But, according to Max Müller, the several deities are not regarded as supreme each in his own domain, but every one is in turn identified with the one omnipotent Divinity everywhere to be recognised amid the forces of nature. To this form of belief, midway between Polytheism and Monotheism, Max Muller has given the name of Kathenotheism. It is important to observe that, on the one hand, the state of society, as pictured in the Vedas, is one raised far above the pastoral or nomad stage, and that, on the other hand, it is entirely free from the characteristic corruptions of modern Hinduism. The Hindus of the Vedic period are not only acquainted with agriculture and many of the handicrafts of civilisation, but they live in walled cities subject to mighty monarchs. The existence of an hereditary priesthood, the exclusiveness of caste, the self-immolation of widows, child-marriage, refusal to eat cows' flesh, repugnance to cross the sea—are all alike unknown to them. The doctrine of metempsychosis, or transmigration of souls, is not found; but a belief in personal immortality is distinctly traceable. The necessity of sacrifice is inculcated from the first. But in the primitive *mantras* sacrifice takes the simple form of offerings of clarified butter and the mystic juice of the *soma* plant, in order that the gods may therewith be nourished and exhilarated. It is only in the later Brahmana, which may perhaps be ascribed to the 7th c. B.C., that expiatory sacrifices come to be regarded as the sum total of religious duty. Ritualistic observance and punctilious attention to ceremonial now take the place of the simple worship and praise of the earlier period; and with these corruptions the priests or Brahmins gradually established their supremacy.

It is only within the present century that the V. has received any notice in the Western world. One of the first to collect MS. fragments from the *pandits* of Benares was Sir Robert Chambers, whose collection now forms part of the royal library at Berlin. The library of the India Office, London, contains the valuable collection of H. T. Colebrooke. Sir William Jones translated certain portions into English. The first complete translation of the Rig-V. was that of Prof. H. H. Wilson, which was published in 4 vols. after his death (1850-66). The text was edited in Roman characters by Prof. Aufrecht (Berl. 1861). The publication of the Sanskrit text, together with the commentary of Sayana, who lived about 1400 A.D., is the special cause of the sojourn of Prof. Max Müller in this country. His first vol. appeared in 1849, and it is estimated that the whole will be completed in 7 vols. This edition was subsidised by the East India Company, on the intervention of Baron Bunsen. See R. Roth's *Zur Litteratur und Geschichte des Weda* (Stuttg. 1846), A. Weber's *Akademische Vorlesungen über Indische Litteraturgeschichte* (Berl. 1852), Max Müller's *History of Ancient Sanskrit Literature* (Lond. 1859), Dr. J. W. Muir's *Original Sanskrit Texts* (2d ed. 5 vols. 1867-72), and A. Kaegi's *Der Rigveda* (Zür. 1878).

Vedd'er, David, a Scottish poet, born in the parish of Burness, Orkney, in 1790, was in early life a sailor and made several voyages to Greenland, entered the revenue service, and in 1820 was appointed tide-surveyor of customs—an office which he held successively at Montrose, Kirkcaldy, Dundee, and Leith. He died at Edinburgh, February 11, 1854. V. was a votary of the muse from an early age, but his first volume, entitled *The Covenanters' Communion and other Poems*, was not published till 1836. His subsequent works are *Orcadian Sketches* (a medley of prose and verse), a *Life of Sir Walter Scott*, and *Ballads and Lyrics*. In 1841 his collected verse appeared in one volume under the title, *Poems—Legendary, Lyrical, and Descriptive*. V. was also a contributor to George Thomson's *Musical Miscellany*, the *Christian Herald*, the *Book of Scottish Song*, and the famous *Whistle-Binkie*. His verse is marked by spirit and force, and at times has the rare merit of originality. See the Rev. G. Gilfillan's Essay on V.'s Life and Writings prefixed to an edition of his *Poems, Lyrics, and Sketches* (Kirkwall, 1878).

Vedettes' (from *video*, 'I see'), mounted sentries stationed in advance of an army's outposts, in order to watch and signal the approach of the enemy. At night or in thick weather V. should be doubled.

Ve'ga, a star of the first magnitude in constellation Lyra, is situated very near the great meridional circle which passes through Sirius, but on the other side of the Pole Star, from which it is distant about half the distance of Sirius from the same. Consequently at midnight in winter it lies low on the northern horizon as seen from Britain, while in summer it is near the zenith.

Ve'ga Car'pio, Lo'pe Fe'lix de, was born at Madrid, 25th November 1562, and losing his father in infancy was brought up probably by an uncle, the Inquisitor Don Miguel de Carpio. A poet ere he could write, a Latinist from his sixth year, he profited much by two years of study at the Imperial College of Madrid, but with a schoolmate ran away to the Leon fief of his fallen house (1576). A twelvemonth later he was fighting against the Portuguese in the Azores; then, after holding some post about the Bishop of Avila and taking his bachelor's degree at Alcalá, Lope returned to Madrid, and became confidential secretary to Alva, the great duke's grandson, at whose suggestion he wrote his *Arcadia*, a pastoral romance. An unlucky duel, following a prosperous marriage, brought him imprisonment and banishment to Valencia, whose term was scarce over when his young wife died, and Lope, in despair for her loss or a new mistress' scorn, shouldered the musket and shipped on board the Invincible Armada (1588). More fortunate than his only brother, he found himself safe back at Cadiz after a four months' cruise, and presently glorified his country's ruin in the *Drakontea*, the epic consecrated to its hero's shame. During his tenure of two more secretaryships he laid the foundation of his dramatic fame; but marrying again (1597), again to become a widower, saddened moreover by the death of a lawful and a base-born son, he turned to religion, and, taking the tonsure at Toledo (1609), became a Franciscan, a zealous familiar of the Holy Office, a doctor of theology, and chief chaplain of the native priesthood of Madrid. Not that as churchman Lope shunned the world; rather, his cloistered leisure was given to writing the bulk of those unclerkly comedies that made him the idol of high and low, and brought him riches, soon squandered in thriftless charity. Only immediately before the end he fell into a settled melancholy, and hastened that end by fasting and cruel discipline, dying at Madrid, 25th August 1635. Reputed author of 21,000,000 verses, Lope was entitled the 'Monster of Literature' by his less popular compeer, Cervantes; and even the *Globe* itself could not contain a catalogue of all his works —the epics, pastorals, elegies, sonnets, and myriad such-like echoes of the Italian muse. Nor upon these did either his living or posthumous success depend, the *San Isidro* (1598), *Hermosura de Angélica* (1602), *Jerusalen Conquistada* (1609), *Pastores de Belen* (1612), *Corona Tragica* (1627), and *Laurel de Apolo* (1630), being words and mere words—names rather, one should say—tedious and highflown, utterly lacking the old Castilian fire. Out of the thousand couplets of the mock-heroic *Gatomachia* (1634), a few survive as proverbs; and some of his lighter essays —gay songs and roundelays, ballads and *glosas*—outlive their ponderous and learned brethren. It was as playwright Lope won his spurs, a playwright too of the most national type. He entered the lists against the Erudite School, then striving to rear a theatre on classic lines, and wrote for his auditors, the pit that paid. The vulgar, he knew, admire a mirror more than a Raffaelle; and so he deliberately Castilianised every subject, classical, sacred, or mediæval, and owned in

his *Arte nueva de hacer comedias* (1609) that six alone of his 483 *best* plays were fairly regular; which six, no critic ventures to decide. Ticknor divides his dramas into four principal classes, under 'Comedias de Capa y Espada' (genteel), grouping *El Azero de Madrid* (prototype of *Le Médécin malgré lui*), *La Noche de San Juan*, and *El Premio del bien hablar*; under 'Comedias Heróicas' (historical), *Roma abrasada*, *El Principe perfecto*, *El Nuevo Mundo*, *El Castigo sin Venganza*, and *La Estrella de Sevilla*; under 'Comedies founded on Common Life,' *La Donzella Teodor* and *Cautivos de Argel*; and under 'Autos Sacramentales,' the *Nacimiento de Christo*, *Los Trabajos de Jacob*, and *La hermosa Ester*. Dwelling exclusively on the local existing manners of a narrow, artificial age, and sacrificing all interests to the interests of plot, Lope wrote not for the foreigner or futurity. His plays remain an inexhaustible storehouse, whence Dryden professed to have taken more than from all the French and Italian authors put together; but Lord Holland read only 56 of them, Sismondi 36, and hardly a living Spaniard has mastered half that number. Lope's miscellaneous works were published at Madrid (21 vols. 1776), and a selection from them by Don Cayetano Rosell is included in the Collecion Rivadeneyra (Mad. 1856), as well as one (4 vols. 1855–60) from his comedies, the completest edition of which is in 25 vols. (Mad. 1604–47). See, besides the authorities cited under SPANISH LANGUAGE AND LITERATURE, Lord Holland's *Lives of Lope de V. and Guillen de Castro* (2d ed. 2 vols. Lond. 1817), Southey in the *Quarterly Review* (vol. xviii. 1817), and Ernest Lafond's *Études sur la Vie et les Œuvres de Lope de V.* (Par. 1857).

Veg'etable I'vory, See IVORY, VEGETABLE.

Veg'etable Marr'ow. See GOURD.

Veg'etable Physiol'ogy is the section of botany embracing the vital phenomena of plants, and the functions of their various organs. As a scientific study it dates from the time of Stephen Hales (q. v.). All organic life requires the presence of water, it being an abundant constituent of protoplasm, and therefore essential for cell-development; and as the plant grows it is further necessary as a solvent of the reserve materials which from time to time have to be transported in all directions through the structure. In addition, for our ordinary flowering-plants to thrive, water sucked up by the root-hairs flows in a current throughout their system to recoup the loss from leaf-evaporation. The essential elements of plant-food are carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, chlorine, iron, manganese, potassium, and calcium. The root-system absorbs nutrient substances in a variety of compounds, and the leaves absorb a proportion in a gaseous condition. By a process called assimilation this raw food undergoes important transformation, through the influence of light, in those cells of the plant which contain Chlorophyll (q. v.). The actual growth of the plant is the result of this assimilation, a portion of the products serving for present use, and the balance forming a store of reserve material (see SAP, and SECRETIONS, VEGETABLE). The organs of a plant can only perform their functions within a range of temperature from above freezing-point of the sap to a maximum of about 120° F. The most refrangible rays of light are chiefly concerned in influencing growth. Gravitation exercises a powerful influence on growth. The above general statements do not apply to the bulk of cryptogamia, nor to the vital phenomena of parasitic and carnivorous phanerogamia. As to the functions of the various organs, information has been given in the articles ROOT, STEM, LEAVES, FLOWER, STAMEN, PISTIL, FRUIT, and it is only necessary to add here a short statement of the mode of reproduction in the vegetable kingdom. There are two distinct modes of reproduction, and plants usually possess both: they are distinguished as the non-sexual and the sexual. The first named occurs in a variety of modifications, and is variously termed reproduction by *spores*, *conidia*, *gonidia*, *gemmæ*, *bulbils*, *buds*, &c. In the lower plants the most common mode of multiplication is by the Spore (q. v.). Conidia are nearly related to spores, are indeed spores under abnormal surroundings, and gonidia may be regarded as a higher condition of conidia, and are almost peculiar to Lichens (q. v.). In gemmæ the cells are united into regular groups, in which condition they detach themselves from the parent plant; they especially occur in the *Muscineæ*, in Hepatics (q. v.), being developed in special bowl-like conceptacles, and in Mosses (q. v.) in all parts of the plant. Bulbils become spontaneously detached from the parent plant, and falling to the ground continue to grow like seedlings. The mode of reproduction by buds is of the highest practical importance, since by it gardeners propagate from *cuttings*, *runners*, &c., and by the operations known as *Grafting* (q. v.), *budding*, *layering*, &c. In sexual reproduction cells of two different kinds are necessary to produce the new plant by their mutual action one on the other. The process is called *fertilisation* or *impregnation*, and involves a distinction between the fertilising or *male* element, and the fertilised or *female* element. In the flower of an ordinary flowering-plant we find an external calyx and corolla protecting the organs of reproduction, the outer being the Stamen (q. v.) holding the pollen, and the inner the Pistil (q. v.) which embodies the Ovule (q. v.). The period of maturity of the pollen and of the capacity of the ovule for fertilisation generally coincides with that of the expansion of the flower. The pollen grains are carried to the *stigma* by varied and complicated contrivances, wind and insects being the principal active agents. The operation is called *pollination*. When pollination has been accomplished, the pollen-grain, excited by a viscid fluid excreted by the stigma, puts out one or more long tubes. These penetrate through the tissues of the *style* and reach the cavity of the ovary, where they come in contact with the ovules and attach themselves closely to them, fertilising one or both of the *embryonic* or *germinal vesicles* contained in the *embryo-sac* of the ovule resulting in the formation of the *embryo*. If two vesicles are fertilised, one almost invariably perishes while the other undergoes further development. During growth the embryo is almost always nourished by tissue developed in the embryo-sac, and termed *albumen* or *endosperm*. If the whole of the albumen is absorbed by the growth of the embryo, the mature seed is *exalbuminous*; if a portion of it is left, the seed is *albuminous* (see SEED). The processes concerned in fertilisation and formation of the embryo in the gymnosperms differ somewhat from the above, but not sufficiently so to require detail.

Vegeta'rianism, the practice of subsisting solely upon vegetable food, has of late years come prominently before the public in connection with dietetic reform. In a state of savagery, man's instincts lead him quite as strongly towards an animal as to a vegetable dietary. An animal's adaptability to any special kind of food in reality depends on and is indicated by such circumstances and conditions, as (1) the nature of the teeth, (2) the length and complexity of the digestive canal, (3) climate, (4) habit and constitution. Thus, judged by his teeth and digestive system, man is adapted for a mixed diet, and not exclusively for vegetable food. His digestive system stands midway in point of length and complexity between the long and complex alimentary tract of the plant-eating animals and the short and simple digestive tube of the carnivora. The modifications produced, however, in human food by habit, constitution or race, and climate, are numerous and important. Thus the Eskimo by nature lives largely on fat and blubber—such foods being heat-producers. In the northern regions of the earth man must perforce be an animal feeder, because he requires heat, and because no adequate plant-life is developed in such latitudes. The Hindu, on the other hand, exemplifies a case in which a plant-dietary is well adapted to his race, habits, and climate. In temperate climates, a mixed dietary is that which experience proves to be the most suitable food for man. Vegetarianism is, therefore, in such climates a system not for the many, but for the few. Certain persons of a full habit of body benefit from its practice, but in ordinary cases ill-health may follow the disuse of animal food; and it is to be noted besides, that vegetables not merely require greater digestive power than animal food, but that they also contain much less nourishment in proportion to their bulk. Probably the practice of V. has done service in showing that, as a rule, a less quantity of animal food than is generally taken is sufficient to support the body in health.

Vehm'gericht. See FEMGERICHTE.

Ve'ii, a city of ancient Etruria, on the banks of the Cremera, about 12 miles N. of Rome, near the modern *Isola Farnese*. It is said by the Roman historians to have been strongly fortified, rich, and populous at the founding of Rome, and to have possessed territory extending along the right bank of the Tiber, from Soracte to its mouth. A struggle soon commenced between

the two cities, which lasted for three and a half centuries, in fourteen distinct wars, and which was ended by the capture of V., after a ten years' siege, by the dictator Camillus (396 B.C.). The chief incidents in the long struggle were the episode of Porsena (q. v.), and the slaughter of the Fabian clan by the Veientes in 476 B.C.

Veil, the thin gauzy face-covering in common use among ladies in civilised communities. It occupies an important place in the symbolism of marriage ceremonies; hence nuns on entering on their union with the Church are said 'to take the V.' The veiling of the face of women among Mahommedan communities is very strictly enforced, it being regarded as gross pollution to allow any stranger or heretic to see the uncovered face.

Veins, those blood-vessels of animals which return impure blood to the heart and lungs or breathing organs for purification. The *pulmonary* V., however, return *pure* blood from the heart to the lungs; and the *portal* V. carry venous blood to the liver, where it is utilised in the manufacture of bile. The V. are composed of three coats. The internal coat is of delicate tissue, lined with epithelial cells. The middle coat consists of muscular fibres, and the outer coat of areolar tissue, and is thicker than the corresponding coat in an artery. The great majority of the V. are provided with *valves*. These valves are pocket-like folds of the lining membrane of the vessel, and essentially resemble the semilunar valves of the aorta and pulmonary artery of the heart. The free margins of the valves in the V. are turned towards the heart, so that the pockets distend and fill, if the current of blood should pass backwards in the V. Most commonly the valves in V. exist in pairs. The blood in the V. is forced towards the heart chiefly by muscular pressure. The ordinary movements of the body thus assist the flow of blood in the V., and the valves, as already remarked, prevent regurgitation. The valves are most numerous in the V. of the legs. The *venæ cavæ* and portal V., as well as the hepatic, renal, and pulmonary V., are destitute of valves.

The principal *diseases* of the V. are described under Phlebitis, Phlebolithes, Thrombosis, Phlegmasia Dolens, and Varicose Veins.

Veins, in geology, are bands or threads of mineral traversing some other and older rock. The small V. which we see in great abundance running through rocks of almost every age, both igneous and stratified, seem to have been mere cracks produced during the process of cooling or solidification, and in which afterwards quartz, carbonate of lime, pyrites, or some other mineral has become deposited. The large V., from which we derive the greater part of our supplies of tin, copper, and the precious metals, may extend for many miles, and attain a great and often unknown depth. Their average breadth is from two to three feet. These metallic V., called *lodes* by the Cornish miners, frequently coincide with Faults (q. v.), and appear to have been huge rents or fissures produced by earthquakes or other great convulsions. The sides of the V. are in many instances striated and polished by being rubbed against each other during the formation of the fissure. These smooth surfaces are known to the miners as 'slickensides.' Pebbles and fossils which have been now and then found in V. prove these to have communicated with the surface of the land, or the bed of the sea. The Cornish lodes are said to vary greatly in their metallic richness according to the rock which they pass through. 'A vein, for instance, which yields abundance of ore in granite, may be unproductive in clay-slate or Killas, and *vice versâ*.' V. may be straight or tortuous; of uniform thickness, or alternately swollen and contracted; and, lastly, not unfrequently show evidences of having been repeatedly opened up, each time receiving a new deposit of mineral.

Veit, Philipp, a German painter, was born at Berlin, February 13, 1793. His mother, a daughter of Moses Mendelssohn, having procured a divorce from his father, became the wife of Friedrich Schlegel; and the lad was thus brought directly under the influence of Schlegel's philosophy. He studied painting under Friedrich Matthäi at Dresden, went to Rome in 1825, and worked along with Cornelius, Schadow, and Overbeck. In 1830 he was appointed director of the Städel Institute at Frankfurt; but his fanatical attachment to the principles of the Romantic school induced him to resign his office in 1843, because the institute had bought Karl Friedrich Lessing's 'Huss before the Council of Constance.' At first he settled in the suburb of Sachsenhausen, on the other side of the river from Frankfurt; but he was afterwards called to be director of the picture-gallery at Mainz, where he died, 18th December 1877. Among his paintings—which were mainly Biblical or ecclesiastical—it is sufficient to mention the 'Scenes from Dante's Paradiso' in the Villa Massimi at Rome (*fresco*), the 'Introduction of Christianity and the Arts into Germany' in the Städel Institute (*fresco*), the portraits of Karl the Great, Otto IV., and Friedrich II. for the imperial chamber at Frankfurt, an 'Ascension of the Virgin' for the Frankfurt Cathedral, and the 'Two Marys at the Grave' for the King of Prussia.

Veitch, Rev. William, LL.D., an illustrious Scottish scholar, belongs to an old Border clan, and was born at Spittal, in Roxburghshire, towards the close of last century. He was grounded in learning, under Dr. Lorraine, at the parish school of Jedburgh, whence he passed to the University of Edinburgh, where he was contemporary with Edward Irving and Thomas Carlyle. The professors who exercised the greatest influence on V. were Christison (Latin), Dunbar (Greek), and Brown (Moral Philosophy), for all of whom he still cherishes an affectionate remembrance. V. studied for the Church of Scotland; but, though one of the most learned and loyal of her sons, he never undertook the charge of a parish. On the completion of his university curriculum he settled in Edinburgh, where his long life has since been almost uninterruptedly devoted to Greek and Latin philology. The fruit of an immense and honourable industry is seen in his *Greek Verbs, Irregular and Defective* (1848), a work unique in its character and merits, and one which in all probability no other man in the United Kingdom could have produced. When it first appeared there was scarcely sufficient learning in this country to appreciate its rare quality, but it soon won recognition from the great linguists of Germany, with several of whom, *e.g.*, W. Dindorf, G. Curtius, K. W. Krüger, W. Pökel, &c., V. has long held friendly intercourse; and some years ago the Clarendon Press Delegates paid the venerable scholar the highest compliment in their power by placing his volume in their series of publications. In this form it has become widely known in England, and is now (1879) in its third edition. V. also gave the Delegates valuable help in their new edition of Liddell and Scott's *Greek Lexicon*. In 1868 his *alma mater* conferred on him the degree of LL.D. V.'s familiarity with the text of a Greek author could not be surpassed by an Alexandrian grammarian, and has enabled him to destroy with that fatal 'weapon of precision,'—a quotation, many a time-honoured dogma in the creed of lexicographers. Although relentless where the honour of scholarship is concerned, he is a man of genial and vivacious humour, and full of Border lore and anecdote, subjects on which he lingers 'with fond recollection.'—**John V., M.A., LL.D.**, a Scotch professor and author, was born at Peebles, 24th October 1829, studied at the University of Edinburgh, and in 1850 published a translation of Descartes' *Discours de la Méthode*, with a preliminary essay on the Cartesian philosophy. It was followed in 1853 by a translation of the *Meditations*, &c. From 1855 to 1860 he acted as assistant to Sir William Hamilton and his successor in the chair of Logic and Metaphysics, Professor Fraser, when he was himself appointed to the chair of Logic, Metaphysics, and Rhetoric in the University of St. Andrews. Along with the late Professor Mansel of Oxford, he edited Sir William Hamilton's *Lectures on Metaphysics and Logic* (1859-60). He was transferred in 1864 to the chair of Logic and Rhetoric in Glasgow University, and in 1869 published a Memoir of Sir William Hamilton. In 1872 he received from his *alma mater* the degree of LL.D. Since then V. has apparently abandoned philosophy for poetry and the lighter sorts of literature, his latest works being *The Tweed and Other Poems* (1875), and *The History and Poetry of the Scottish Border* (1877).

Velas'quez, Don Die'go Rodrig'uez de Silva y, the greatest of Spanish painters, was born of a Portuguese family at Seville, 6th June 1599. From the studio of Francisco Herrera, an artist of some note, he passed to that of Pacheco, whose daughter, Juana, he married in 1620. His early art, humble in aim and somewhat vulgar in type, is seen at its best in the 'Water-Carrier' (Aquador) at Madrid, a work of characteristic vigour and keenness. To this early experience has been ascribed a certain want of elevation in his later work, an absence of the higher eclectic spirit manifested by tolerance of the painful or

ugly. In 1622 V. went to Madrid, where in the year following his portrait of Olivarez procured him the patronage of Philip IV., a wonderful portrait of whom at once established the fame of the painter. As court painter he produced many portraits of the royal family and of illustrious visitors, the latter including one of Charles I. of England, which has been lost. V. formed a cordial friendship with Rubens during the diplomatic visit of the Fleming to Madrid in 1628. In 1629–31 he made a tour in Italy, visiting Rome, Naples, Florence, Venice, &c., and being received everywhere with the highest distinction. His style, already fully developed, bears little trace of Italian influence, but his admiration was sympathetically touched by the glory of Venetian art, and he expressly records his preference for Titian over Raphael and Michael Angelo. On his return to Madrid he made rapid progress in the royal favour; he was made royal Ayuda de Camera or chamberlain (1643); his studio was removed to the palace, and there in friendly converse with the painter the king spent much of his leisure. This relationship was undisturbed by V.'s grateful conduct to the disgraced favourite, Olivarez, and in 1648 he was sent by the king to Italy, commissioned to buy works of art. At Rome he painted the portrait of Innocent X., which is now the gem of the Doria gallery. He was subsequently appointed Aposentador Mayor, or royal seneschal, and in 1656 received the Cross of Santiago, an honour till then reserved for the highest nobility. But V. did not thrive under his load of honours; his health gave way in the service of the court; and he died at Madrid, 7th August 1660. His wife, to whom he was passionately attached, was laid beside him in the church of San Juan two weeks later. Although there are specimens of V. in the galleries of London, Paris, Vienna, Munich, &c., it is only at Madrid that the range and resource of his art can be duly estimated. His portraits are not mere, 'sallow, mustachioed Spaniards in black cloaks,' but veritable human counterfeits, strong, vivid types of individuality, instinct with the subtlest shades of expression. The 'Adoration of the Magi,' his earliest-known picture, bears date 1619, and among his better-known works are the 'Boracchos,' 'Forge of Vulcan,' 'Joseph's Coat,' 'Surrender of Breda,' a 'Crucifixion,' 'Dwarfs,' 'Coronation of the Virgin,' 'The Meniñas' or 'la Familia' (royal family), the 'Hilanderas' or 'Spinners,' and, his last, 'St. Anthony the Abbot visiting the first Hermit St. Paul in the Desert' (1659), of which Wilkie says it has 'the very same sun we see, and the air we breathe, the very soul and spirit of nature.' His historical pictures are grandly representative, and combine imaginative power with technical dexterity. Only in the treatment of religious subjects does he fail of the highest success, and only fails in defect of that sacrosanct purity, that spiritual majesty, which was the rare gift of the older Italians. Courts could not make a courtier of V., whose main characteristics are dignified repose and uncompromising honesty. The brown tone, dark shadows, and hard outlines of his earlier style were gradually replaced by a chord of silvery-grey, by aerial clearness and transparency, and a finer gradation of tints. His versatility is seen in his triumphant treatment of animals, landscape, and domestic life. As a colorist V. belongs to the first rank; his execution, strong, rapid, and rugged, has exerted a powerful influence on painters so unlike as Wilkie and Phillip, as well as on the modern Spanish school represented by Madrazo and Fortuny. See Stirling, *V. and his Works* (Lond. 1856); Fr. Pacheco, *Arte de la Pintura* (Mad. 1866); Eastlake, *History of Oil-Painting;* Madrazo, *Discurso Inaugural* to the Academy of San Fernando (Mad. 1870), and an article in the *Quarterly* (vol. 133, 1872).

Velell'a, or Sallee' Man, a species of *Cœlenterate* animals in some degree related to the jellyfishes, but distinguished by the diagonal crest or sail borne on the upper surface of the organism, and which is used as a means of propulsion. The bulk of the V. (of which *V. vulgaris* is the common species) consists of the rhomboidal *pneumatophore*, or float bearing the diagonal crest, placed vertically. A single polypite depends from the flat structure, with reproductive bodies and tentacles. The average length of the V. is about 2 inches long by 1½ inches in height. The organism is of a beautiful delicate blue tint.

Velez' Mal'aga, a town in the province of Malaga, Spain, on the left bank of the Velez, 16 miles E. of the town of Malaga, and 2 miles N. of the Mediterranean coast. It is an old, decayed-looking place, but has a lucrative trade. Two fine churches and the ruins of a high Moorish tower are its chief buildings. The fine climate, combined with constant water-supply, favours the growth of sugar-cane, rice, cotton, palms, oranges, maize, sweet potatoes, &c.; much wine is also produced. Numerous ancient towers along the sea-coast (some probably Carthaginian), are now used as watch-towers. Pop. 16,000.

Ve'liki-Lu'ki, an old town of Russia, government of Pskov, on the Lovat, 124 miles N.W. of Smolensk, with 9 churches and 2 monasteries, and manufactures of Russia and other kinds of leather. Pop. (1871) 5714.—**V.-Ustiug'**, a town of Russia, government of Vologda, at the junction of the Jug and the Suchona, 240 miles N.E. of Vologda, and on the great road from Archangel to Siberia. One of the principal seats of industry in N. Russia, it has active manufactures of cloth, linen, leather, soap, wax-candles, enamelled gold and silver wares, and a large trade in furs. Pop. (1871) 7792.

Veli'no. See TERNI.

Velle'ia, or **Vele'ia**, a town of ancient Liguria, the remains of which are 24 miles S.E. of Piacenza. It is believed to have been buried by a landslip in the reign of the Emperor Probus, though we have no contemporary record of such an occurrence. In 1747, the discovery of a bronze tablet led to extensive excavations being commenced in 1760, which were continued until 1775, and resulted in the discovery of an amphitheatre, temple, and forum, besides a great quantity of antiquities now in the museum at Parma.

Vellei'us Pater'culus. See PATERCULUS.

Velle'tri (the Volscian *Velitræ*), a town of Central Italy, province of Rome, picturesquely situated on a spur of the Alban Hills, near the Pontine Marshes, 26 miles S.E. of Rome by rail. It is the seat of the Bishop of Ostia, and has a cathedral (San Clemente), a classical school, a technical school, and several fine palaces. On the 19th March 1849 V. was the scene of a defeat of the Neapolitan troops by the Roman Republicans under Garibaldi. Pop. (1874) 13,584.

Vellore', the most populous town of the district of N. Arcot, Madras Presidency, British India, near the left bank of the Palar river, 80 miles W. of Madras by rail. Pop. (1871) 38,022. The old fort, which was formerly very strongly garrisoned, now contains only a single regiment of native infantry. Inside there is a pagoda, with beautiful stone carvings. A central jail has lately been built for 1000 long-term prisoners, where excellent carpets, rugs, &c., are manufactured. V. was the scene of a mutiny in 1806, when the native sepoys rose and murdered 113 European officers and soldiers. The outbreak was promptly suppressed. It was supposed to have been instigated by the sons of Tippoo Sultan, who had been confined in the fort as state prisoners since 1799. They were forthwith removed to the neighbourhood of Calcutta, where the last survivor died in 1875. See Kaye's *History of the Sepoy Mutiny* (vol. i.).

Vello'zia, a genus of plants belonging to the small monocotyledonous natural order *Hæmodoraceæ*, or the blood-root family. Tree-lilies is the name applied to the commoner species. Their height varies from 2 to 10 feet; the branches terminating in tufts of stiff aloe-like leaves and large solitary blue, white, or violet flowers. As V. grows it continues to bear the withered remains of the leaves, and the surface of the trunk as it ages is enveloped in a mass of adventitious adpressed rootlets. In the dry mountain regions of Brazil V. is a marked feature of the scenery.

Vell'um. See PARCHMENT.

Velo'city, in kinematics, is the rate of change of position of a point per unit of time. Change of position is essentially a Vector (q. v.), and when this change of position is considered with reference to time the vector quality still remains. Hence we see that V. is a vector, and as such subject to all the laws which regulate such quantities. A body describing spaces proportional to the times is said to move with uniform V., which is then found numerically by dividing the space described in any time by that time. Unit velocity is defined as the V. with which a moving point describes unit space in unit time; hence since $v=\frac{s}{t}$ we see that a velocity is of *one* dimension in length and *minus one* dimension in time, or involves the length unit directly and the time unit inversely. If the V. changes from

point to point, then the V. is said to be variable. In such a case if we divide the space described by the time taken to describe it we get what is called the *average velocity* during that time; and if the time of description be taken shorter and shorter this average V. will more nearly approach in value the real V. during the interval. In this way we may approximate more and more to the value of the V. at any instant, but only if the V. suffers no abrupt change during the short interval of time chosen. The possibility of *measuring* a variable V., however, does not affect the conception of such a V., which must have a finite value at any given time. Remembering that a V. is defined as rate of change of position of a moving point, or in other words the rate at which the path of a moving point grows, we may follow Newton and represent the V. by the fluxion $\dot{s}$ where s is the position of the moving point measured from an arbitrary origin along the path; $\dot{s}$ is a finite quantity, and when we say that the V. of a moving body at the point s is $\dot{s}$, we mean that if the body were then left to itself it would proceed in the direction of the tangent to the curve at s with a velocity represented by $\dot{s}$. The rate at which the velocity changes is called the acceleration, and may be represented by the symbol $\ddot{s}$. See KINEMATICS, MOTION, LAWS OF, &c.

Vel'vet (Old Eng. *velouette*, from Old Fr. *velous*, Lat. *villosus*, 'hairy'), is a silken textile, woven with a looped surface which is cut, and forming a thick, close-set pile. The art of weaving V. probably originated in China. In mediæval times it was much valued for ecclesiastical vestments and costly church draperies. Patterns were woven in V. by introducing pile of different colours, or the same colour in different lengths, and in this style the Italians, Spaniards, and Flemish excelled.

Vendace' (*Coregonus Willoughbii*), a peculiar species of *Teleostean* fishes, belonging to the family *Salmonidæ* (q. v.), and noted for its peculiarly local distribution. It occurs at Lochmaben, in a few English lakes, and in several Swedish waters. The average length of the V. is about 6 or 7 inches. Its body is deep, and of compressed shape, and the under jaw projects beyond the upper. The tail is forked, and the body tapers markedly. The back is brown, and there is a heart-shaped patch of red hue between the eyes. The spawning season is in November and December. The V. is highly esteemed as a food-fish, despite its small size. It is fished at the beginning of August, and is caught in sweep-nets. See COREGONUS.

Vendée, a department of France, formed from a part of Poitou, bounded N. by the departments of Loire Inférieure and Maine et Loire, E. by Deux Sevres, S. by Charente Inférieure, and W. by the Atlantic Ocean, along the coast of which are several islands belonging to it, the largest Dieu and Noirmoutiers. Area, 2588 sq. miles; pop. (1876) 411,781. V. divides itself naturally into three divisions; the *Bocage*, in the N., a part of the former district known as V., still largely covered with wood crossed by several small streams, and yielding wine, fruit, and vegetables; the *Plaine*, comprising the whole district between the Bocage and the S. frontier, a fertile tract, but without adequate water-supply; and the *Marais*, a swampy tract along the coast, part of which has been made fit for cultivation by a system of canals and dikes. The collieries of V. yielded (1875) 316,748 metrical quintals: and in 1876 its agricultural produce was wheat (6,050,000 bushels), barley (695,200 bushels), wine (20,809,360 gallons), besides oats, buckwheat, flax, turnips, hemp, and rapeseed. The capital is Roche-sur-Yon (q. v.). The Vendean insurrection against the French Revolution is noticed under CATHELINEAU, CHOUANS, and LAROCHE-JAQUELEIN. See also Daniau's *Histoire de la V.* (vols. i.-ii., Angers, 1878).

Vendémiaire ('wine-month'), in the calendar of the First French Republic, the period from September 23 to October 21.

Vendett'a (Ital. 'vengeance,' from Lat. *vindicare*), the Corsican system of private feud by which the kinsfolk of a murdered man were bound to avenge his death; either by slaying the actual murderer, or, in the case of his escape, his relatives. Such feuds accordingly might extend to entire families and clans, to villages and districts, and, handed down from one generation to the other, might outlive their motive by fifty years. Even to-day, in spite of the energetic measures of the Italian government for its repression, the evil has hardly yet been extirpated in Corsica; and in Sicily (q. v.), nourished by the *omertà* and communal *mafias*, it flourishes with increased ferocity. In the V. one recognises a survival of that primitive and world-wide principle that the individual must defend himself and his from wrong-doing or avenge a committed wrong, which presents itself in the Avenger of Blood (q. v.) of Mosaic time, at Athens in the defence of the slayer of Eratosthenes (403 B. C.), at Rome in the *Lex Julia de Adulteris* (17 B.C.), in the old Teutonic *fæde* or Feud (q. v.), and at a later date among the Albanians, Beduins, Circassians, Australian aborigines, and other uncivilised races. That principle lies at the root of all criminal jurisprudence, since, with the gradual widening of the social circle, the individual's wrong concerns the *gens*, the tribe, the nation; and thus by degrees his right to defend himself against his wrongdoers become the state's to defend itself against the misdoings of its own members by legal punishment, or against the misdoings of other states by formal war. See WEREGILD and Lecture VI. of Freeman's *Comparative Politics* (Lond. 1873).

Vendôme', a town of France, department of Loir-et-Cher, on the Loire, 34½ miles N.N.E. of Tours by rail, contains a ruined château, five churches, of which La Trinité dates from the 15th c., a college founded by César, Duc de V. (1594-65), a lyceum, public library, theatre, &c. Glove and paper making form with tanning the principal industries. Pop. (1872) 9259. Capital of a former duchy, V. was the scene of conflicts in the Franco-German war (15th December 1870 to 6th January 1871).

Vendôme', Louis-Joseph, Duc de, grandson of a natural son of Henri IV., was born in Paris, 1st July 1654, and till his father's death in 1669 bore the title of Duc de Penthièvre. He entered on a career of arms under Turenne's guidance (1672), served with distinction in Elsass, Piedmont, and Catalonia, forcing Barcelona to surrender (1696), and on the outbreak of the Spanish War of Succession (1700) received the command of the French army in Italy. In 1703 attempting to force a passage through the Tyrol and effect a junction with the Elector of Bavaria, he was brought to a stand at Trent by the valiant resistance of the mountaineers; but in the autumn of the same year he disarmed the troops of the Duke of Savoy, who had broken with France, took several fortresses of Piedmont, and opened the long investment of Turin. In 1706 he had just profited by Prince Eugen's absence to drive the Imperialists across the Adige, when he was recalled to the Netherlands, and there, after taking Ghent and Bruges, was crushingly defeated at Oudenarde (q. v.) in 1708, and had to yield Lille to the Allies. This reverse and the machinations of Mme. de Maintenon brought him two years' disgrace; but at length the desperate state of the French cause in Spain forced Louis to send him once more to the Peninsula, where, having brought Philip V. back to Madrid, he made Stanhope and 5000 English prisoners at Brihuega, and next day virtually ended the war by his victory over Starhemberg at Villa-Viciosa, 9th December 1710. He did not long enjoy the honours now showered upon him, dying at Vinaroz in Valencia, 15th June 1712. A singular medley of strength and weakness, V. was an indolent and thoughtless gourmand, but could rouse himself in a sudden emergency, then acting with keen and cold-blooded energy. See St. Simon's *Mémoires*; Voltaire's *Siècle de Louis XIV.*; Villeneuve, *Éloge du Duc de V.* (Agen 1783); and *Le Duc de V. en Espagne* (Par. 1824).

Veneer' (Ger. *furnieren*, 'to veneer,' 'to inlay'), a thin slice of fine wood, ivory, or tortoiseshell, fastened with glue and strong pressure to another material for ornamentation. The process, which is termed *veneering*, was known to the ancients, and is still extensively practised; furniture, &c., constructed of pine or other inferior wood, being commonly covered with a layer of walnut, rosewood, mahogany, satin-wood, amboyna-wood, thuya, or other valuable and beautiful wood. Veneers are *cut* or *sawn* from the solid block by machinery. Marquetry (q. v.) is an effective application of veneers.

Vene'real Disease'. See SYPHILIS.

Vener'idæ, a family of shells belonging to the *Molluscan* class *Lamellibranchiata* (q. v.), and to the section having large respiratory *siphons* or breathing-tubes. The shell is orbicular or oblong, and has a toothed hinge and an external ligament. The foot is tongue-shaped, and the mantle has a large anterior opening. The siphons are unequal, and are usually more or less completely united. Some of the V. are among the most highly-organised of their class. To this family belong the exist-

ing Venus-shells, and the well-known genus *Cytherea*. Both are first found as fossils in the Oolitic rocks.

Venesec'tion. See BLOOD-LETTING.

Vene'tian Chalk', a synonym for French chalk, which is simply steatite in mass or powdered.—*V. Lake*, a pigment prepared by mixing a concentrated solution of Brazil wood with alumina and glue.—*V. Red*, a brilliant red ochre obtained from Italy, and extensively employed as a pigment.

Venezue'la, a S. American Republic, composed of twenty-one states, and having an area estimated at 403,275 sq. miles. It is bounded N. by the Caribbean Sea, E. by the Atlantic and British Guiana, S. by Brazil, and W. by the United States of Colombia, but the two last boundaries are not absolutely determined. The country is traversed by two mountain chains, offshoots of the Andes, between which are the great low-lying plains called *Llanos* (q. v.). The northern chain runs N.E. past the southern end of Lake Maracaybo (q. v.) to the sea at Puerto Cabello, and then runs eastward along the coast as far as the Gulf of Paria. Its highest points are, the Sierra Nevada of Merida, 15,342 feet; Mount Picacho, 14,168 feet; and the Silla de Caracas, 8632 feet. The other chain crosses the country to the S. of the River Orinoco (q. v.), and consists of a number of parallel ranges bearing the general name of Mountains of Parimé. They attain a maximum altitude of 10,000 feet, but their average height does not exceed 4000 feet. This part of the country is still very imperfectly known, but is broadly divided into three physical regions, viz.—1. *Tierras calidas* ('hot lands'), reaching up to 4000 feet above the sea-level. 2. *Tierras templadas* ('temperate lands'), between 4000 and 7000 feet. 3. *Tierras frias* ('cold lands'), above the last limit. The first region possesses a luxuriant tropical vegetation, including magnificent forests abounding in valuable timber, medicinal plants, and dyewoods; the second is well suited to the growth of cereals and beans; while the third is comparatively bleak and well-nigh uninhabited. The Orinoco and its tributaries constitute the principal river-system of V., but there are also some considerable streams flowing into Lake Maracaybo and the Caribbean Sea. The indigenous fauna include the puma, ounce, jaguar, deer, monkeys, alligators, and snakes, and birds of many kinds. Cattle, horses, and mules are now reared in great numbers on the extensive plains. The staple crops are coffee, cacao, cotton, tobacco, and indigo, in addition to which the exports include hides, skins, horns, dyewoods, gold, copper, and salt. Gold is obtained at Caratal, Nouveau Monde, and Callao (in the last two places since January 1879), and copper at Aroa, which is connected by a railway 70 miles long (opened February 7, 1877) with the port of Tucácas on the N. coast. Commerce is much hindered by the lack of roads and of better means of transport than mules. The *Estadistica Mercantil* of November 1877 gives the gross imports for the financial year 1875-76 at £2,777,572 (28 per cent. to England, 17 per cent. to the United States, 16¼ per cent. to France, 14⅜ to Germany, and 8 per cent. to the English colonies), the duties on which amounted to £964,112; and the exports at £3,098,582 (coffee, £2,194,136, of which £9010 to England; cacao £288,790, of which £2692 to England; cotton £105,390, hides, goatskins, and deerskins £126,239). The number of ships entering the ports of V. in 1874 was 2200 (at La Guayra 175 of 148,360 tons, at Puerto Cabello 256 of 126,260 tons). In 1878 the imports from England had a value of £473,584, the exports to England of £97,079; and in 1876 the public debt, interior and exterior, amounted to £12,817,825. The capital is Caracas (q. v.), and the other chief towns are Cumana (q. v.), La Guayra (q. v.), Puerto Cabello (q. v.), and Angostura (q. v.). Several of the towns of V. have suffered severely from earthquakes at various times. The pop. of V. in 1873 was 1,784,194, of whom one-third were whites, one-half Zamboes (a mixed Indian and Negro race), and only one-thirtieth pure Indians. The last are the most industrious portion of the population. V. was discovered by Columbus in 1498, and in 1499 Vespucci and Ojeda seeing in Lake Maracaybo the Indian village of Cora, which was built upon piles, named it V., or Little Venice, an appellation subsequently extended to the whole country. In 1813 V. revolted from Spain, and in 1819 was recognised as forming with New Granada and Ecuador the independent Republic of Colombia, but in 1831 V. separated from the other states, and became a republic in 1863. Since then it has been the scene of perpetually recurring civil wars. At present (April 1879) a 'revolution' is in progress. See Sach's *Aus den Llanos* (Leip. 1878), Tejera's *V. Pintoresca, &c.* (2 vols. Par. 1878), and Spence's *Land of Bolivar* (Lond. 1877).

Ve'nial Sins. The distinction made in Roman Catholic theology between mortal sins and V. S. was first made in connection with Church discipline. St. Augustine in his book of *Faith and Works* distinguishes sins into two kinds: greater, or those which obliged men to do public penance, and which he called mortal; and lesser, such as sins of the tongue and thoughts, and the immoderate use of lawful things, which he called *venial*, not because they were not mortal in their own nature, but because in comparison with the others they were of an inferior nature, and not so easily proved on men; and because men were cleared from them without the humiliation of a public penance, by private repentance, and daily prayer and reformation. The same distinction is made in the writings of many of the early Fathers. The sins for which public penance had to be undergone were all enormous sins, such as idolatry, apostasy, divination, murder, adultery, theft, and sacrilege. But this is not the distinction which is made in later theology in connection with the doctrines of purgatory and auricular confession, and especially in the writings of the casuists. There is so much diversity of opinion among the writers themselves that no precise definition of V. S. can here be given, farther than that they are those minor sins to which even the best are liable, and from which even those who escape the punishment of hell have to be purified in Purgatory (q. v.) before they can enter to heaven.

Ve'ni, Crea'tor Spir'itus, is the first line of a fine old Latin hymn occurring in the Roman Breviary in the offices of the Feast of Pentecost. It is popularly ascribed to Karl the Great, but is certainly older than his time, and is probably the composition of Gregory the Great. It has always been used in the church on occasions of extraordinary solemnity, as at the creation of popes, &c. The estimation in which it has been held is shown by the circumstance that it is the only hymn retained in the liturgy of the Anglican Church, in which it occurs in the offices for the ordering of priests and the consecrating of bishops. Another Pentecostal hymn, the *Veni, Sancte Spiritus*, is ascribed to Robert II. of France.

Venice (Ital. *Venezia*, perhaps from Celt. *gwen*, 'a plain'), the pile-built city of the Adriatic, stands at the N.W. angle of the Gulf, on three islands and 114 islets, which, parted by 157 canals, are linked together by 380 bridges. Since 1845 a railway viaduct, 2⅓ miles long, connects it with the Italian mainland, and so with Padua, 23½ miles to the W.; seaward, long insular sandhills, strengthened by mighty walls of white hewn marble and pierced by four openings, shelter the tidal basin of the Lagunes. To the tides which, here rising from 2 to 6 feet, send their pulsations through every vein of this peculiar city, it owes its healthy saline atmosphere; but for long centuries the Brenta, Piave, and other impetuous affluents of the Adriatic, from whose alluvium the islands formed themselves, have striven to turn the Lagunes into a brackish swamp, to raise their bed, and so, by obstructing the natural canals and sea approaches, strip V. of her maritime dominion. And in spite of vast sums expended on the diversion of river channels, on ceaseless dredging, and the construction of dikes and breakwaters, the Porto del Lido (once the main gateway to the outer sea) has gradually become so silted up, that vessels of heavy tonnage must now go round by a southern passage, the Porto del Malamocco. Two schemes are now (1879) before the Government, one to join V. to the mainland by filling up the shallow intervening Lagune (with an area of 124,000 acres); the second and more feasible, finally to remove the Brenta's mouth at a cost of £165,000, and then re-open the Porto del Lido at a cost of £360,000 more. Another pressing want is the provision of better drinking-water than is at present furnished by the 6782 rain-water cisterns dug since 1303; by seventeen artesian wells (1847-52), which, only bored to a depth of 450 feet, are either ferruginous or so gaseous as to flame at the touch of a lighted match, and by the extra supplies brought daily in tanks from the impure Seriola Canal on the nearest mainland. Not till the solving of both these problems can V. be confident of keeping her present, still less of regaining her past, prosperity.

To come to the city itself, the V. of vaporous sea-mists and hue of mother-of-pearl, with waves for horizon, or the far Euganean

Hills, the V. of marble churches and palaces, all glorified with the genius of Pisano, Sansovino, Scamozzi, Palladio, and Canova, of Giorgione, Titian, Tintoretto, and Veronese. About 7 miles in circumference, V. is cleft into two unequal halves by the Canale Grande, which, nearly two miles long by from 36 to 66 yards wide, winds in the form of an inverted S, is spanned by the marble Rialto (1588-91) and two iron bridges (1854-58), and is to V. as the Corso to Rome, the Boulevards to Paris. Canals, indeed, are here the thoroughfares, with sable Gondolas (q. v.) for carriages; sometimes a strip of pavement (*calle*) fringes their margin, oftener the houses rise sheer from the water's edge. By means, however, of 1914 such labyrinthine *calli*, a slender land communication is preserved with the 41 squares, of which the Piazza S. Marco alone deserves the name. Flagged with marble, this is on three sides bounded by the arcaded palaces of the Procurators (15th c.–1810), E. by the metropolitan Basilica of S. Marco (976–1071), a five-domed Romanesque-Byzantine structure, decked with 500 marble columns and 45,790 square feet of mosaics (10th–16th c.). Its form is that of a Greek cross. Alexandrian mosques suggested the general features, marbles from the harem-floors of Eastern emperors panel its sanctuary, and over its principal portal stand the four horses of gilded bronze, which from surmounting the arches of Nero and Trajan at Rome passed to Constantinople in the 4th c., and thence to V. (1204), whither having been carried to Paris by Napoleon (1797), they were restored (1815). From the Piazza the isolated Campanile (911–1591), 322 feet high, and mounted by a spiral upward-sloping plane, uprears for colossal vane a golden angel; the Masts at its foot no longer flaunt their Cyprian, Cretan, and Morean banners, but, opposite, the Torre dell' Orologio (1492, restored 1859) still tells the hours on its quaint automatic dial. During 1800–78, 88 churches and over 200 palaces were demolished, but 99 churches still remain, besides a Protestant, a Greek, and an Armenian church, and 7 synagogues. Of these survivors the following are most noteworthy:—the cruciform Frari (1250–80), with the tombs of Titian, two doges, and Canova, and in whose neighbouring monastery the Public Records (q. v.) are stored; the little 6th c. S. Giacomo; the domed S. Giovanni e Paolo (1240–1430), the doges' sepulchre, but by fire despoiled (1867) of its Cappella del Rosario and Titian's 'Peter Martyr;' S. Maria dei Miracoli (1480; restored 1879); Il Redentore (1577), Palladio's masterwork; the 15th c. S. Rocco, whose adjoining Scuola (1517–50) contains fifty-six paintings by Tintoretto; S. Salvatore (1534–1663; restored 1877), where Caterina Cornaro, Queen of Cyprus lies interred; S. Sebastiano (1506–18), the burial place of Veronese, and S. Zaccaria (1457–1515), of Alessandro Vittoria. Supreme among secular buildings, the Ducal Palace stands S. of the cathedral, fronting the Lagune. Five times destroyed by fire since its foundation in 809, each time to arise with renewed magnificence, it represents the labour of 600 years, its massive colonnades and Gothic loggias dating from the 13th, its eastern façade and inner court from the 16th c., while since 1853 the whole square fabric, 'so beautiful in the regularity of its pointed windows, so singular in its mosaic diaper of pink and white,' has been restored. The Scala dei Giganti, where the doges were crowned, and the Scala d'Oro, once trodden by none save nobles of the 'Golden Book,' lead to vast corridors and council-rooms, which, walled and roofed with priceless masterpieces of Venetian art, are at present occupied by a library of 10,000 MSS. and 130,000 volumes, a coin collection, and archæological museum. To-day the Lion's Mouth gapes idly for denunciations; prisoners no longer traverse the Bridge of Sighs; nay, the Piombi, or lead-roofed dungeons of the uppermost story, are shorn of even their traditionary dread. Across the Piazetta, beyond the two granite columns brought hither from Syria (1120), and marking the place of execution, the Library (now part of the Royal Palace) and Mint stand, triumphs of Venetian architecture (1536), also so splendidly exemplified in sixty-three palaces lining the Canale Grande. Many of these now serve as hotels or public offices, and Palladio's Scuola della Carità (1552) is tenanted by the Academy, the gem of whose gallery of 700 paintings is Titian's 'Assumption.' Of the six theatres, La Fenice (1836) accommodates 3000 spectators; other buildings are the Seminario Patriarcale, the Scuola di S. Marco (1485; a hospital since 1815), an immense female lunatic asylum (1875), two gymnasia, &c. The famous Arsenal, whose archway is guarded by four marble lions, brought from the Piræus (1687), and scored with Runic Inscriptions (q. v.), was the first of its name, being founded in 1104. It extends over 89 acres, and in the 16th c. contained 40,000 sailors and 16,000 shipwrights, who at the shortest notice could turn out a fleet of eighty-five galleys. In 1875 its 2000 workmen built only forty-three vessels of 1310 tons, but signs of renewed activity are the construction (1876–77) of a large dry-dock, two graving-docks, and Free Warehouses, and the recent opening of four lines of navigation, of which the Peninsular and Oriental conveyed 4881 passengers to Alexandria in 1876. In 1877 there entered the port 2885 vessels of 570,014 tons, and cleared 2914 of 580,580 tons, while the imports (oils, colonials, wine, and spirits, silk, cotton, and coal) amounted to £4,803,009; the exports (grain, hemp, timber, glass beads, enamel, &c.) to £1,779,399. The industries of V., like her Arsenal, pride themselves chiefly on past achievements—the Glass (q. v.), mosaics, lace, tapestry, Aldine Editions (q. v.), and exquisite bindings of the 16th and earlier centuries. But some, that survived uninterruptedly, seem to have taken a fresh development; others, intermitted awhile, have lately been renewed. The glassworks, for instance, whence Benedict Biscop procured the windows for his Abbey of Wearmouth (674), could, thanks to Salviati's fostering care, export goods to the value of £2,449,611 during 1862–71, and 1874 saw the revival of tapestry and lace working, the former an art (older than that of Lyon) which once employed 14,000 hands. Wood-carving, too, is again a thriving handicraft; a recent discovery for casting in bronze without modelling in wax or after polishing promises a new era of perfection in bronzes; and lastly, as the abode of above 100 eminent artists mostly engaged upon English commissions, V. bids fair to retrieve the lost laurels of the Venetian School. The pop. from 190,000 had sunk in 1789 to 139,095, in 1857 to 118,172, but upon 31st December 1877 numbered 130,816.

In the days of the Wandering of Nations, when Attila destroyed Aquileia, Padua, and the adjacent towns (452), many of their inhabitants fled to the Lagunes, and 'fixed like waterfowl their nests upon the waves.' The only spot in Western Europe that never acknowledged a Teutonic master, V., from a mere aggregate of tribune-governed islands, became a republic under a single Doge (q. v.) in 697. The barrenness of these islands, whose sole commodity was salt, made commerce a necessity; and seated between the Lombard and Byzantine realms, each needing what the other only could purvey, V. through commerce soon waxed so great as to capture Ravenna (737), gradually to relax her dependence on Constantinople while gaining sovereignty over the Istrian and Dalmatian seaboards, and to repulse the fleet of Pippin (809) from the Rialto, the seat of government thenceforth. Hither were brought the relics of St. Mark, filched from the infidels of Alexandria (829), and here, in front of that saint's basilica, Barbarossa abased himself before Pope Alexander III., who rewarded V. for services then rendered to the Church with the ring of espousal to the Adriatic (see BUCENTAUR). This great event took place in 1177, the age of the Crusades (q. v.), and five years after that founding of a Great Council of 480 members which marks the close of V.'s earlier history, the troublous times when out of fifty doges five abdicated, nine were deposed, five massacred, and five sent blinded into banishment. The Crusades gave V. an enormous impulse, shown in her undertaking (1201) to transport to Palestine 30,000 men and 14,000 horses for 85,000 marks, in her capture of Constantinople (1204) under blind old Dandolo (q. v.), and in her acquisition of a clear moiety of the Eastern Empire, including Candia, the Morea, and three of the eight quarters of Constantinople. But these successes awoke the jealousy of Genoa (q. v.), and a doubtful contest of 130 years ensued, in which the annexation of Corfu poorly made up for the re-establishment of the anti-Venetian Byzantine Empire (1261). V. must now open up communication with Arabian powers, and so bring over Alexandria the wares of far Eastern lands, sought out by the enterprise of Marco Polo (q. v.) and other of her daring sons. In this she succeeded, but at home the government passed from a democratic to an aristocratic character (1286–1319), the *Serrar del Consiglio* excluding from the Grand Council all but the nobles of the Golden Book, and thus creating the haughty patriciate which 'reduced,' says Gibbon, 'the doge to a pageant and the people to a cipher.' Conspiracies against this dominant order led to the institution of a Council of Ten, the dreaded inquisitorial tribunal, rendered perpetual in 1335; and for the plot of

1355 even the Doge, Marino Falieri (q. v.), paid forfeit with his life. A war with Hungary cost V. her Dalmatian provinces (1358), but the annihilation of the Genoese fleet off Chioggia (1379) gave her the undisputed mastery of the sea, and contests with Padua and Milan during the dogate of Francesco Foscari (q. v.) extended her dominions on the Italian mainland, while Caterina Cornaro (q. v.) made over Cyprus to the republic (1489). But growth of dominion was dearly purchased at the decline of a commerce which, wounded by Turkish aggressions, received its deathblow from the Portuguese discovery of the Cape route to India (1498). Diplomacy broke up the formidable League of Cambrai, formed against V. by Emperor, Pope, and the Kings of France and Aragon (1508); but in spite of the glories of Lepanto (1571), and the gallant defence of Candia (1645–67), this island, like Nauplia, Cyprus, and the Morea, had passed in 1718 to the Turks. The degeneracy and secret terrorism, marked by external pomp, of V.'s last three centuries, are well exemplified by the eighty gaming-tables kept by patricians in 1735, and by the current maxim that 'courtesans could be usefully employed to ruin men whose wealth might make them dangerous.' The republic began with Attila, and ended with Napoleon, who in 1797 entered V., never trodden by hostile troops in all the preceding 1300 years. Ceded to Austria by the treaty of Campo-Formio, it was annexed to Italy (1805), but nine years later restored to the House of Hapsburg. The revolt under Manin (q. v.) was only suppressed, in spite of internal dissensions, after a siege of fifteen months, which cost the Austrians 20,000 men; and, finally, the Austrian reverses in the campaign against Prussia led to the incorporation of both city and territory with the kingdom of Italy, Victor Emmanuel making his entry 7th November 1866. See Daru, *Histoire de la République de Venise* (3 vols. Par. 1821; 4th ed. 9 vols. 1853); Ruskin, *The Stones of Venice* (8 vols. Lond. 1851–53; new and enlarged ed. 1874), and *St. Mark's Rest* (3 parts, Orpington 1877–79); Lorenzi, *Monumenti per servire alla Storia del Palazzo Ducale dal* 1253 *al* 1797 (vol. i. Ven. 1868); Baschet, *Les Archives de Venise* (Par. 1870); Romanini, *Storia di Venezia* (2 vols. Ven. 1875); Symonds' *Renaissance in Italy: The Fine Arts* (Lond. 1877); and Yriarte, *La Vie d'un Patricien de Venise au Seizième Siècle* (Par. 1874), and *Venise: Histoire, Arts, Industrie, la Ville, la Vie* (Par. and Lond. 1878); this last a splendid folio, embellished with 525 engravings.

Venlo', a town of Holland, province of Limburg, on the Maas, 19 miles N.W. of Viersen by rail. The town, which was fortified previous to 1868, is closely and irregularly built. It is the centre of the Krefeld, Maastricht, and Breda system of railways, and has manufactures of gin, cigars, and sewing-needles. Pop. (1870) 7754, mostly Roman Catholics.

Venn, Rev. Henry, born at Barnes, Surrey, in 1725, from a school at Bristol proceeded to Jesus College, Cambridge, where he graduated B.A. (1745), and obtained a fellowship at Queen's. After holding a Clapham curacy he became vicar of Huddersfield (1759), and rector of Yelling, Huntingdonshire (1770), which latter living he held till shortly before his death at Clapham, in June 1797. A founder of the Evangelical school in the Church of England, V. published *The Complete Duty of Man*, an *Examination of Priestley's Address on the Lord's Supper* (1769), *Mistakes in Religion* (1764), &c.

Veno'sa (anc. *Venusia*), a town of Italy, province of Potenza, 7½ miles E. of Melfi, is the seat of a bishop, has a castle, a cathedral, the ruins of a splendid abbey (Santa Trinità), with a monument of Alberada, first wife of Robert Guiscard, and old Jewish catacombs. Pop. (1871) 7222. V. is the birthplace of the poet Horace.

Ventila'tion. See WARMING AND VENTILATION.

Ventimi'glia, an Italian village, province of Porto Maurizio, on the Gulf of Genoa, 21½ miles E. of Nice by rail. It is a frontier town, and standing on a hill, has some military importance. Besides its castle, it has a cathedral and some Roman remains. The trade is in wine. Pop. (1872) 3518.

Vent'nor, an English watering-place on the S. shore of the Isle of Wight, and the southern terminus of the Isle of Wight railway, 11 miles S.E. of Ryde. It is picturesquely situated amid the charming scenery of the Undercliff, and with a warm southern exposure has become one of the most popular of English winter resorts. Among the attractions are the abundance of fossils and the beautiful beach of yellow shingle. V. has a good gas and water supply, excellent hotels, baths, reading-rooms, &c., and publishes a weekly newspaper. A new district church, of Holy Trinity, in Early Pointed style, was erected in 1862, and the National Consumption Hospital founded in 1872. Pop. (1871) 4841.

Ventric'ulites, a genus of fossil *Spongida*, or Sponges, characteristic of the Cretaceous or Chalk Rocks. *V. radiatus* is a familar species, occurring in the White Chalk. The V. were allied to the living deep-sea sponges known as *Holtenia*. They appear to have anchored themselves to the sea-bed by a bunch of fibrous roots.

Ventril'oquism (Lat. 'a speaking from the belly') is an art of speaking in such a manner that hearers are deceived into the belief that the sounds proceed from places other than that occupied by the ventriloquist. The term is incorrect, as the vocal sounds are produced by the *larynx* or organ of voice, but the expression of the face and movements of the lips and cheeks are restrained and modified so as to give the idea of the speaker being voiceless. One notable feature of successful V. consists in directing the attention of the hearers to the supposed quarter from which the sounds are to proceed; the performer being thus left unwatched to a great extent. In V. a long breath is first inhaled; this inspiration being slowly and gradually exhaled, and vocal power thus husbanded. There is no special qualification required for becoming a ventriloquist; long and continuous practice will ensure success.

Venue is the place to which a jury is summoned to try an action. It must be set forth in the plaintiff's pleading, and is usually in the county in which the ground of action lies; but the judge may change the V. asked for to another, either of his own accord or on the showing of the defendant that that other is a more desirable one. A criminal case must be tried in the county in which the crime is committed.

Ve'nus, popularly known as the 'goddess of love,' was originally an Italian goddess of the spring, and at a comparatively late period of Roman history became identified with the Greek Aphrodite, who in turn was only a modification of the Phœnician Ashtaroth, Asteroth, or Astarte. Hence various elements in her character and history. At times she appears as the goddess of the sky and of the moon (V. Urania), and at times as the goddess of the ocean; now she represents the general motherhood of nature; now she is regarded as especially the deity of wedded love, and now she serves as patroness for the impure gratification of sexual passion. According to the most popular form of her myth, she rose resplendent from the foam of the ocean, and after visiting Cytherea, landed on the shores of Cyprus, the island which was long the chief seat of her worship. Besides her son Eros (Lat. Amor or Cupid), she was accompanied by the *Charites* ('Graces'), *Himeros* ('Desire'), *Pathos* ('Anxiety'), and *Peitho* ('Persuasion'). She was married to Hephæstus (Lat. Vulcan), but proved a faithless spouse; her intrigues with Ares, her passion for the beautiful shepherd Adonis, and the favours she bestowed on Anchises, being scandalous incidents in her history. The dove, the ram, the hare, the dolphin, and the tortoise; the rose, the myrtle, and the apple were her principal symbols. Besides Paphus, Amathus and Idulian in Cyprus, Cytherea, Corinth, Carthage, and Eryx in Sicily, were chief seats of her worship. Her early introduction into Greece—when she was distinguished by such epithets as *Urania*, *Pandemos*, and *Anosia*—is proved by the presence of her symbol, the tortoise, on the earliest known Greek coins, those of Ægina. It was only in later times that she became popular at Rome, and this late popularity was mainly due to the connection established between the early history of Rome and the Trojan heroes. V. was naturally a favourite subject with the ancient poets and artists, and some of her statues are among the noblest remains of Greek and Roman sculpture. At first she was always represented as clothed, but after Scopas and Praxiteles it was common to dispense with drapery either partially or entirely, and at length in the hands of the baser sort of artists the goddess became little better than a naked woman, and was not even 'clothed on with chastity.' The positions and accessories are varied to an endless degree. Now she appears as *V. victrix*, holding a spear and treading on a helmet; now as if she had just risen from the foam of the sea (*Anadyomene*);

now as if she were leaving or entering the bath; now upborne by Tritons; now crouching (*V. accroupie*) as if to tie her sandal; now playing with Eros; now recumbent on her swans. Among the most famous of her statues are the V. of Cnidus by Praxiteles, only preserved to us in copies; the V. of Milo, so called from the island of Melos, where it was found in 1820, and the V. de Medici, which was dug up in several portions in the 17th c.

Ve'nus, the brightest and most beautiful of all the planets, is the second in order from the sun, if we neglect the dubious Vulcan. It thus lies within the earth's orbit, revolving round the sun at a mean distance of 66,134,000 miles in an elliptic orbit of eccentricity ·00686, which is inclined to the ecliptic at an angle of 3° 23′ 31″. Its sidereal period is 224·7008 days, or about $\frac{8}{13}$ths of our year. On account of this near commensurability of the periods of V. and the earth, a remarkable inequality exists, whose period is, according to Airy, about 240 years. The diameter of V. is estimated as 7510 miles. Hence the volume is ·855 of the earth's, and the density being a little greater than that of the earth, the mass is nearly the same as the earth's. On account of the excessive brilliancy of the surface of the planet, it is impossible to make accurate observations of it. The length of its day has, however, been fixed at 23 hours, 21 minutes, 22 seconds, and its axis of rotation is believed to be inclined at an angle of 74° to the plane of its orbit. With such an inclination the seasons on the planet must suffer extraordinary variations. Viewed through the telescope, V. presents phases like the moon. The full phase, however, being at superior conjunction, cannot be observed on account of the sun's excessive brightness. Consequently only a portion of its surface can be seen at any one time, and the brilliancy of the planet depends as much upon its distance as upon the amount of surface visible. The position of greatest brilliancy is at about 40° from the sun. The greatest possible elongation of the planet is 47° 12′, and hence V. is never seen at any great distance from the sun, but usually precedes or succeeds it by a brief interval of time. In the former case it is the *morning star*; in the latter, the *evening star*. At inferior conjunction, the dark side of the planet is turned towards us; and should the node of its orbit lie between us and the sun, the phenomenon known as the Transit of V. takes place. The planet then appears as a dark speck crossing the sun's disc; and being then at its nearest distance from the earth (some 25,000,000 miles), its parallax can be directly measured, and thus afford a means for calculating the parallax of the sun, one of the most important units in astronomy. This method of calculating the sun's distance was suggested by Halley, and was first successfully applied in 1769. These transits, however, are of very rare occurrence, recurring at intervals of 8, 122, 8, 105 years, so that four transits take place every 243 years. The last transit was in June 1874, the next will be in December 1882, and the next again not till June 2007. See SUN.

Ve'nus' Gir'dle (*Cestum Veneris*), the name given to a species of *Cœlenterate* (q. v.) animals, belonging to the highest group of that sub-kingdom—the division *Ctenophora* (q. v.). It appears in warm seas as a long, band-like animal, attaining a length of from 2 to 3 feet. At night it is markedly phosphorescent.

Ve'nus' Flower Basket (*Euplectella*) a beautiful genus of flinty or *Siliceous* Sponges, of which *E. aspergillum* and *E. suberea* are familiar species. It exactly resembles a delicate vase. The single large *osculum* forming the mouth of the sponge is covered by a kind of grating. The sarcode or horny matter is of brownish hue, and the flinty spicules are large. These sponges are found at the Philippine Islands, and are fixed to the sea-bed by a long coil of flinty fibres forming a kind of root.

Ve'nus' Fly'-Trap. See DIONÆA.

Ve'nus' Look'ing-Glass is *Specularia* or *Campanula speculum*, a favourite garden annual, native of S. Europe. The name was given from the resemblance of its pretty flowers set upon their cylindrical ovary to an ancient round mirror at the end of a straight handle.

Ve'ra, Cue'va de, a town of Spain, province of Almeria, on the Almanzora, near its entrance into the Mediterranean, 65 miles S.W. of Carthagena. It has an old Moorish castle, and a massive parish church, and produces pottery, wine, oil, &c. There are mines in the vicinity. Pop. 10,500.

Ve'ra Cruz', Vill'a Ri'ca de la ('rich city of the true cross'), the principal seaport of Mexico, and capital of a state of the same name, on the Gulf of Mexico, 190 miles E.S.E. of the city of Mexico by rail. It is surrounded by strong walls, and is further defended by two redoubts, and by the famous castle of San Juan de Ulloa, on an island of the same name, half a mile from the shore. The town is regularly and substantially built in the old Spanish style, the houses being variously coloured, and having balconies, arcades, and galleries. There are sixteen churches, a municipal palace, a custom-house, several hospitals, a library, a theatre, &c. The town is lit with gas and laid with tramways, while the supply of water has been recently augmented by the construction of works. The harbour is little more than an exposed roadstead, but a mole was completed in 1875. Many vessels are wrecked during the Nortes or north hurricanes, which sweep along the shore and deluge the town with sand-showers. Yellow-fever is the scourge of V. C., but it has been rendered less virulent by greater attention to sanitary conditions. More than half the trade of the republic passes through the port, the exports comprising precious metals, cochineal, sugar, provisions, indigo, sarsaparilla, logwood, jalap, vanilla, and pimento. The aggregate value of these in 1873 amounted to $17,939,000, and that of the imports, chiefly manufactured goods, to $14,114,000. The exports are mainly to Great Britain and the United States. Pop. (*Memoria del Ministro de Fomento*, 1877) 10,000. Founded by Cortes in 1519, V. C. was subsequently removed to Antigua, some miles to the N., but was brought back to its original site in 1590. The castle of Ulloa was held by the Spaniards till 1825, and both castle and city were bombarded and taken by the French in 1838. V. C. was besieged and captured by the United States army under General Scott in 1847.—The *state* extends along the Gulf in a narrow belt for nearly 500 miles, and is flanked by the Sierras, at a distance from the sea of some 30 miles. The coast tracts are sandy, are indented by lagoons, and are hot and malarious. Along the rivers, Panuco, Papaloapam, Goatzacoalcos, &c., there are fertile districts and rich pastures, while further inland rise the snow-clad volcano Orizaba, 17,176 feet high, the Cofre de Perote, near Jalapa, 14,309 feet, and Tuxtla, 9708 feet. This state is traversed by two railways, from the city of V. C. to Mexico and Jalapa respectively. Area, 26,232 sq. miles; pop. (1877) 504,950.

Ver'atrine, or **Verat'ria** ($C_{32}H_{52}N_2O_8$), a member of the group of organic bases known as the Alkaloids (q. v.), is obtained from the seeds of *Veratrum sabadilla*. It is insoluble in water, but dissolves in hot alcohol and in ether. *Colchicine*, extracted from *Colchicum autumnale*, was originally confounded with, but is now recognised as distinct from V.

Medicinal Properties of V.—V. is exceedingly irritating to any surface it may come in contact with. When taken internally in small doses, it lowers and weakens the pulse; in medium doses it produces gastro-intestinal irritation; and in large doses, violent vomiting, serous purging, often with intense burning in the mouth and throat, and general muscular weakness. At present, it is rarely employed except as a local application in cases of rheumatic neuralgia, narcotic poisoning, as an irritant applied to the spine, and to paralysed limbs. One-sixteenth of a grain has produced the most alarming symptoms. The only pharmaceutical preparation is *Unguentum V.*, and even this should be cautiously used.

Verat'rum. See HELLEBORE.

Verb (Lat. *verbum*, '*the* word,' so called because it is the most important word in a sentence) is the part of speech that affirms or asserts—*e.g.*, 'he is;' 'the sea roars;' 'Cæsar smote the Gauls.' An examination of these sentences, however, shows that while the V. in each case affirms, the extent and the mode of its affirmation are different. Thus, in the first example, mere existence is affirmed of the subject; in the second, action is affirmed irrespective of an object; in the third, the affirmation is limited by the introduction of an object. The classification of verbs gives expression to these differences. Three classes are enumerated—(1) Transitive; (2) Intransitive; (3) Neuter. A V. is transitive when the action it expresses 'passes over' to an object—*e.g.*, Cæsar *smote the Gauls*; it is intransitive when the action is confined to the actor, or at least does not refer to an object—*e.g.*, 'the sea *roars*;' and it is neuter ('neither') when no action at all but only a state or condition is expressed—*e.g.*,

'he *is*.' Verbs are modified to express Voice, Mood, Tense, Number, and Person. In highly-inflected languages such modifications are minutely carried out, and require great patience and perception to master and observe. In English they are of course extremely few. The 'voice' of a V. is that form which shows whether the subject of the affirmation or predication is the actor or the object acted upon. If the former, the V. is said to be in the *active*; if the latter, in the *passive* voice —*e.g.*, in the sentence, 'the sea roars,' the V. is active; in 'the body was thrown into the river,' it is passive. 'Mood' is the 'mode' or manner of predication. There are in English four moods—(1) the *Infinitive*, which is used to express a state or action free from any limitation of person, number, or time, *e.g.*, 'to err is human; to forgive, divine'; (2) the *Indicative*, which makes an affirmation without reference to any contingent circumstance, *e.g.*, 'they grew in beauty side by side;' (3) the *Subjunctive*, which is used to affirm not absolutely but contingently—*e.g.*, 'If I were not Alexander, I would be Diogenes;' (4) the *Imperative*, which includes various forms of predication by means of which we command, exhort, request, or supplicate—*e.g.*, 'Get thee behind me, Satan'; 'Stay, lady, stay, for mercy's sake.' Tense (from Lat. *tempus*, 'time') introduces into the affirmation of a V. the element of 'time.' Tense has a relation to the three divisions of time—present, past, and future; but to each of these the affirmation may stand in a threefold relation. The action predicated may be spoken of (1) as *Indefinite*—*e.g.*, I write, wrote, shall write; (2) *Imperfect*, I am writing, was writing, shall be writing; (3) *Perfect*, I have written, had written, shall have written. We have thus nine primary tenses. Number and person are also modifications of a V., for the purpose of showing whether the affirmation is made of one or more persons, and whether the speaker is making an affirmation about himself (first person), or about the person he is addressing (second person), or about some other person or thing (third person). In English, verbs are arranged for conjugation into two classes, the weak and the strong (see CONJUGATION). For details consult Mason's *English Grammar* (19th ed. 1874), and Bain's *Higher English Grammar* (Lond. 1874).

Verbena'ceæ, a large natural order of monopetalous dicotyledons, consisting of herbs, shrubs, and trees. It has been divided into three sub-orders:—(1) *Myoporineæ*, natives of Australia, S. America, and S. Africa; (2) *Verbeneæ*, natives of temperate and tropical America, and found also in Asia and Europe; and (3) *Selagineæ*, represented in Europe, but chiefly belonging to the Cape of Good Hope. The most important member of the order is Teak (q. v.). See also AVICENNIA. Many of the V. are fragrant and aromatic, some are bitter, tonic, and astringent, others are acrid. None enter into the British pharmacopœia. The order is familiarly represented in gardens by the verbena, and in hothouses by beautiful climbers belonging to *Clerodendron*. See VERVAIN.

Vercell'i, a city of Italy, province of Novara, on the Sesia, 13½ miles S.W. of the town of Novara by rail. In the unhealthy valley where it stands, wheat, silk, and rice are produced. It has handsome boulevards, a market-square with statue to Cavour (1864), a cathedral, with library of valuable MSS., ten other churches, including S. Christoforo, S. Andrea (1219), and S. Caterina, also two hospitals, and an institute of fine art. V. has manufactures of silk, wax, soap, candles, mirrors, and musical instruments. Pop. (1871) 20,140. Ruins of the ancient *Vercellæ* are still seen.

Vercell'i Book, a MS. volume discovered by Dr. Blume at Vercelli in 1823, which, in spite of its mutilated condition, is one of the most valuable relics of Old English literature, containing as it does not only six Saxon homilies, but also six poems which together amount to 7000 lines. A transcript of the poems, made by Dr. Blume for the Record Commission and still preserved by the Master of the Rolls, was printed as an appendix B to the report of the Commission for 1836. The two longest poems, the *Legend of St. Andrew* (3444 lines) and *Elene*, or *The Finding of the Cross* (2648), were published in German by Jacob Grimm, *Andreas und Elene* (Cassell 1840); and the former was again edited with a translation by Mr. J. M. Kemble for the Ælfric Society, 1845–46. The Early English Text Society made arrangements in 1874 for the publication of the homilies.

Ver'den, a town of Prussia, province of Hannover, on the river Aller, 2½ miles above its junction with the Weser, has a Gothic cathedral (1290–1490) and two other Evangelical churches, a Catholic church, and a gymnasium. V. has considerable trade, manufactures tobacco, cigars, and lucifers, and carries on brewing, fishing, and shipbuilding. Pop. (1875) 7669.

Ver'di, Guiseppe', an operatic composer, was born at Rancola, Parma, October 9, 1814. His first opera, *Oberto di San Bonifazio*, was produced at La Scala, Milan, on November 17, 1839. This was followed by *Nabucodonosor* (1842), *I Lombardi* (1843), and *Ernani* (1844), the last two of which made their composer's name celebrated throughout Europe. In the next five years, among other works, he composed the *Duc Foscari*, *Attila*, *Macbeth*, the *Masnadieri*, and *Luisa Miller*. In 1851 he produced *Rigoletto*, one of his most brilliant and finished efforts; and in 1853, *Il Trovatore* and *La Traviata*, which have proved more popular than any operas of equal age. His subsequent works include *Un Ballo in Maschera* (1858), *La Forza del Destino* (1863), *Don Carlos* and *Aïda* (1872), and *Montezuma* (1878). V. is the only worthy living representative of the Italian school of opera, into which he has infused a masculine nervousness and force wanting in the languishing and sentimental style of his immediate predecessors, Bellini and Donizetti.

Ver'dict, in law, is the finding of a jury upon the issue submitted to them. (See GUILTY; JURY, TRIAL BY.) In England, the jury must be unanimous. In Scotland, the verdict is according to the votes of the majority. When it will carry all the costs in a civil action and it is doubtful for which party it will be given, parties may agree to withdraw a juror; there is then no V., and each pays his own costs.

Ver'digris, a compound formed by exposing copper in air to the marc of grapes or other source of acetic acid, is a mixture of several basic acetates of copper which have a green or blue colour. By digesting powdered V. in warm water, a green insoluble part is left which contains a compound having the composition $Cu (C_2H_3O_2)_2 . 2 Cu O + 3$ aq. The soluble part crystallises on cooling and evaporation, forming a compound having the composition $2 Cu (C_2H_3O_2)_2 . Cu O + 6$ aq. By dissolving V. in hot acetic acid, and leaving the filtered solution to cool, dark-green crystals of the normal acetate of copper ($Cu (C_2H_3O_2)_2$ + aq) are formed.

Ver'diter, called also Bremen blue and Bremen green, is a hydrated oxide of copper used as a painter's colour. It is prepared from the subchloride of copper, and in proportion to the completeness of the oxidation of that substance so does the colour vary from a green to a peculiar greenish blue.

Ver'dun-sur-Meuse, a French town and fortress of the first rank, department of Meuse, on both banks of the river, 40 miles W. of Metz by rail. It is the seat of a bishop, and has a cathedral of indifferent merit, a large citadel, cavalry barracks, three hospitals, a public library, &c. The industrial products are spirits, liqueurs, woollens, confections, leather, ironwares, paper, and wine. Pop. (1876) 10,738. Anciently the chief town of the Celtic Verodunenses, and the *Verodunum* of the Romans, V. gave its name to the treaty of 843, by which the empire of Karl the Great was divided into the kingdoms of W. and E. Franks, the beginnings of the modern states of France and Germany. In the late war the Germans failed to take it by a *coup-de-main*, 25th August 1870, but forced it into capitulation by a regular siege extending from 13th October to 8th November 1870.

Ver'ger (Lat. *virga*, 'a rod,' lit. 'the rod-bearer') is an officer in cathedrals and collegiate churches who carries the mace, or symbol of authority before the dean on occasions of ceremony.

Ver'gil, Pol'ydore, a native of Urbino, studied at Bologna, and taking orders became chamberlain to Pope Alexander VI., who sent him to England to receive Peter's Pence (1501). In England he tarried fifty years, holding the rectory of Church Langton, Leicestershire (1503), and archdeaconry of Wells (1508), with prebends of Hereford and St. Paul's (1513), and returning to Italy in 1551, to die four years later at his native town. A slight dispute touching the priority of V.'s *Proverbiorum Libellus* (1498) to Erasmus' *Adagia* led to a life-long friendship between the authors; but V. is better remembered by his *De Inventoribus Rerum* (1499), edition of Gildas (1525), *De Prodigiis* (1526), and *Historia Anglica* (Basel 1534; 7th ed. Lond. 1651). A.

the first history where the facts and statements of earlier chroniclers were weighed and compared, and also by its choice Latinity, the last-named work merited the high value set on it by V.'s compeers. Sir Henry Ellis edited for the Camden Society the three last and first eight books of an old MS. translation of it in the British Museum (1844-46). See the Preface of Dr. W. A. Hammond's translation of the *De Rerum Inventoribus* (New York 1868).

Ver'gniaud, Pierre Victurnien, born at Limoges, 31st May 1753, settled as an advocate at Bordeaux in 1781, and on the outbreak of the Revolution was sent as a deputy to the Constituent Assembly, and afterwards to the National Convention, where his brilliant eloquence gave him a foremost place in the ranks of the Girondists. During the trial of Louis XVI. V. strove with all the power of his oratory to persuade the Convention to let the nation decide the fate of its former monarch, yet when it came to a vote he pronounced for 'death.' After the execution of Louis he became an avowed opponent of Robespierre and the party of the Mountain, was arrested 4th June 1793, and guillotined with twenty of his companions on the 21st of October following. See Barthe, *Les Orateurs Français* (4 vols. Par. 1820); Vermorel, *Œuvres de V., de Gaudet et de Gensonné* (Par. 1866), and Touchard-Lafosse, *Hist. Parlementaire et Vie Intime de V.* (Par. 1848).

Ver'juice, the expressed juice of unripe grapes, or the acid juice of crab apples. It is to a small extent used in the preparation of sauces, &c., and was formerly also employed in medicine.

Verme'jo, a leading tributary of the river Paraguay (q. v.) in S. America. It rises in the Andes, and has a S.E. course of about 600 miles, during the last 450 of which it receives no affluents. It is from 70 to 250 yards wide, and from 5 to 16 feet deep, with a moderate current, and is now regularly navigated. The name V., and its native appellation of Ypytá ('red water'), have reference to the colour of the stream, which tinges the Paraguay throughout its course below the confluence of the two rivers.

Ver'mes, the name given by Linnæus to all animals of worm-like shape, as well as to lower forms of animal life, irrespective of their appearance. At present some zoologists use it to designate the lowest group of annulose animals, while others include under it not merely the latter organisms, but the true *Annelida* (q. v.), or 'worms' properly so-called.

Vermicell'i, a fine thread-like form in which Macaroni (q. v.) is prepared.

Ver'mifuges. See ANTHELMINTICS.

Vermil'ion, or **Cinn'abar**, the red sulphide of mercury, is formed artificially by subliming an intimate mixture of 6 parts of mercury and 1 part of sulphur. The resulting compound (HgS) is then reduced to a very fine powder, thereby acquiring the beautiful bright-red colour peculiar to this pigment. The dull-red native Cinnabar is the most important ore of mercury.

Ver'min (from Lat. *vermis*, a 'worm'), a generic name given to the smaller animals which damage man's crops or other estate, or prey upon his domesticated animals. As thus used, V. includes the smaller mammalia and certain kinds of birds. It is unquestionably from the ranks of the quadrupeds that the great majority of 'V.' are drawn. Thus in gamekeeper's *parlance* all the weasel tribe—stoats, polecats, and weasels—are typical V. Hedgehogs are equally 'V.' in his eyes, because he believes they devour the eggs of game—a belief utterly without foundation. The destruction of hedgehogs, in fact, should be discountenanced, considering the service these animals perform in removing noxious insects. Rats and mice, especially field-mice and field-voles, may increase in such numbers as to destroy large quantities of grain, and thus become decidedly destructive 'V.,' while serious loss may also be caused to the farmer by hares and rabbits as well as by rodents. Amongst birds many of the *Raptores* are destructive to game. The falcons, hawks, and kites are 'V.' in this sense; so also are crows, owls, and magpies; but as the latter feed chiefly on mice and other small quadrupeds they are beneficial to man by repressing animals which are far more typically named 'V.' than themselves.

In the economy of nature a balance of power is rigidly observed, and in the maintenance of such a balance the so-called 'V.' play an important part. Too frequently a limited view of the range and functions of a particular animal or group of animals appears to warrant the supposition that extermination by man is necessary. In the majority of cases natural conditions—such as the changing seasons themselves, scarcity of food, or the great development of some special enemies of the race—suffice to repress a prolific species in time. There is thus little need for Malthusian measures and speculations in lower life; only it must be admitted that occasionally, and during the over-prolific period in the history of animal species, man requires to take measures for the repression of his lower neighbours. Agriculturists in particular, are beginning to recognise the truth of the statement that the birds which visit their fields are of extreme value in the repression of the insects and their larvæ which feed on the tender shoots of the grain. And even admitting that the fields may occasionally suffer from the visitation of common birds, the damage inflicted thereby is but trifling when compared with their services in repressing the insect species. Even the much persecuted mole has been shown by Darwin to be a thorough fertiliser of the ground, and the earth-worm itself acts in this way also. Both animals, in fact, by their operations in turning over the soil, in bringing fresh layers to the surface, and in breaking the clods, tend to open up the ground, and thus to ensure favourable conditions for the germination of the seed. And the despised and hunted rats may be shown, like the whelks and crabs of the sea, to play no unimportant part in nature's sanitary arrangements, by the wholesale destruction of offal and garbage in which they indulge. As *means of repressing V.*, traps and snares of various kinds are in use. Spring traps of ordinary kind, and the stamp traps with powerful teeth, are in use for the capture not merely of rats, but of foxes, weasels, and the like. Other traps, in the form of boxes, the entrance to which is closed by the act of the animal in entering, are also in use, and 'falls,' or traps in which a prop is pushed from under a box as the animal passes below to secure the bait, are well-known contrivances used in the capture, not merely of rats, but of larger quarry. Large numbers of field voles, &c., may be killed by digging shallow pits, these animals being unable to climb out (see VOLE). The *poisons* in common use for rats include arsenic and phosphorus. Rats may be suffocated in barns, &c., by the production of carbonic acid fumes, and by thoroughly closing the doors and windows for a day or two.

Vermont' (Fr. *ver mont*, 'green mountain'), one of the New England States of the American Union, bounded N. by Canada, S. by Massachusetts, E. by New Hampshire, from which it is separated by the Connecticut River, and W. by New York, three-fifths of the boundary being the shores of Lake Champlain (q. v.). Area 10,212 sq. miles; pop. (1870) 330,551. The surface is for the most part mountainous. A range called the Green Mountains traverses the state from N. to S., and divides near Killington Peak (4221 feet) at 44° N. lat. into two chains, of which the western extends in the same direction into Canada, and the eastern stretches in a N.E. direction into New Hampshire. The highest points are Camel's Hump (4088 feet), and Mount Mansfield, with its three summits, the Chin (4430 feet), the Nose (4094 feet), and the Forehead or South Peak (3934 feet), all in the western branch. The rocks are principally Metamorphic, consisting largely of gneiss. On the W. side of the mountains Silurian deposits prevail, with some beds of crystalline limestone overlying the sandstones; but on the E. side Silurian deposits give place to Devonian limestones, and these to strata of slate along the Connecticut River. Copper ores of considerable value occur, besides lead ores more or less argentiferous; and iron, in the form of chromic ores, hæmitite, magnetite, and bog ores. Excellent granite and slates are abundant, besides kaoline, steatite, fire-clay, talc, manganese, and limestone for burning. The eastern part of the state is drained by the Connecticut River and its feeders; the northern part sends small streams to Lake Memphremagog, of which one-fifth part lies within V.; the western portion is drained by the Missisquoi, Lamoille, Winooski, Otter Creek, Hubbardton Creek, and Poultney River, feeders of Lake Champlain; and the S.W. corner by the Hoosac and Battenkill affluents of the Hudson. The valley and meadow land of V. is generally fertile, and the mountain slopes afford rich and nutritious pasture. The principal trees are the fir, oak, hickory, beech,

birch, elm, cedar, juniper, and the sugar rock and red maples. The black bear, panther, lynx, and racoon are abundant, and the moose and elk are still occasionally found. The climate is healthy, though characterised by wide extremes. The mean annual temperature in the N.E. is 40°, in the S.W. and S. 46°. The average highest temperature in 1869 was 91°, the average minimum 29°, the average mean temperature 42·9°, the average annual rainfall 48·60 inches, the greatest amount falling in October. In 1870, V. had 4,528,804 acres of land, in farms of which 3,073,257 were under cultivation; the average size of the farms was 134 acres. The estimated value of the farms was $139,367,075, of all the farm products $34,647,027, and of wages paid $4,155,385. In 1874 the crops were estimated as follows: Indian corn, 1,660,000 bushels; wheat, 418,000; rye, 61,000; oats, 4,151,000; barley, 112,000; buckwheat, 372,000; potatoes, 4,782,000; tobacco, 105,000 pounds; hay, 973,500 tons; and were valued at $18,803,710. In 1875 the live stock was valued at $20,660,594, and consisted of 72,400 horses, 201,500 milch cows, 130,500 oxen, 516,400 sheep, and 52,400 swine. V., though essentially an agricultural state, has considerable manufactures, and ranked at the census of 1870 as 21st state in the Union in this respect. In that year it had 3270 manufacturing establishments, employing 18,686 hands, paying $6,264,581 wages, using $17,007,769 of raw material, and producing goods and wares valued at $32,184,606. The chief products were as follows: lumber, $6,186,660; woollen goods, $3,550,962; flouring-mill products, $2,571,594; leather, $2,012,513; scales and balances, $1,629,000; marble and stone work, $960,984; machinery, $756,080; furniture, $895,606; carriages and sleds, $839,029; hosiery, $551,129; boots and shoes, $547,789; cotton goods, $546,510; and agricultural implements, $523,669. In the year ending 30th June 1877, the imports into V. amounted to $3,688,824, and the exports to $1,338,376. In the same year there entered the ports of V. 675 vessels of 87,703 tons, and cleared 645 of 84,354 tons; while the mercantile marine of the state itself consisted of 5 steam vessels of 2520 tons, and 10 sailing vessels of 554 tons. In 1875 V. had 939 miles of railway. Education is in an advanced state. In 1876 there were 2519 common schools, maintained at a cost of $565,044; 26 incorporated academies and seminaries, 3 normal schools, and 61 other schools of higher grade, not connected with the public-school system. The capital is Montpelier (q. v.), the largest town, Burlington (q. v.). V. was not admitted to the Union until 1791, owing to disputes about the frontier line with New York. Her growth was rapid from that period until 1840, but has been almost stationary since. See H. Hall, *V. from its Discovery* (Alb. 1869).

Ver'nal Grass, Sweet Scented, is *Anthoxanthum odoratum*, one of the commonest British native grasses, and widely spread through Europe, N. Africa, and W. Asia. It is a perennial species, desirable in pastures on account of its early spring growth, and for the flavour that it imparts to hay. The pleasant smell of good new hay is derived chiefly from this grass (whence its specific name), and is dependent on a principle named *Cumarin* (q. v.).

Verna'tion, or **Præfolia'tion,** means the mode in which unexpanded leaves are disposed in the leaf-bud. V. varies considerably in different plants. Thus in firs we have a flat arrangement; in the cherry simply *folded;* in the beech with many folds, or *plicate;* in ferns, *circinate;* in grasses, *convolute;* and in other plants, *revolute, involute, contorted,* and *crumpled.*

Verne, Jules, a popular French story teller, was born at Nantes, February 8, 1828. After producing several comedies and operatic librettos he was fortunate enough to strike on the new vein of fictitious narrative which he has since worked with immense diligence and success. The main characteristic of his method is the continual employment of quasi-scientific material in the construction of his most fantastic and incredible creations. The most remarkable of these productions, which are, however, altogether lacking in pure human interest, are *Twenty Thousand Leagues under the Sea, From the Earth to the Moon, Across Africa in a Balloon,* and *To the Centre of the Earth.* Most of V.'s works have been translated into English and German.

Ver'net, Claude Joseph, a French painter, born at Avignon, 14th August 1714, was the son of Antoine V., a skilful decorator. When eighteen years of age, fired with artistic ambition he set out for Rome, where, though he soon surpassed his master Bernardino Fergioni, a noted painter of sea-pieces, it was some time before his merits were publicly appreciated. In 1745 he was made an associate of the Royal Academy at Paris, and in 1753, after an absence of twenty years, returned to his native country and was received a member of the Academy. Shortly afterwards he was commissioned by the king to paint a series of views of the ports of France, and it was nine years before he completed the task. 'J. V.,' says M. Villot, 'has neither the richness of tone nor the delicacy of execution of the Dutch painters; but he looks at nature in a broad, truthful, and simple way, and always renders it with an easy touch. The numerous figures introduced into his pieces were no mere irrelevant accessories, but gave interest and dignity to the scene. As he said of himself, there were painters who could better paint a sky, a piece of ground, or a wave, but there was no one who could make a better picture.' He died in the galleries of the Louvre, 3d December 1789. His youngest son, **Antoine-Charles Horace,** usually called **Carle V.,** was born at Bordeaux in 1758, studied at Rome, and in 1788 became a member of the Academy. He was mainly a battle-painter, but excelled also in comic genre-pieces, and was particularly successful in the treatment of horses and dogs. The 'Battle of Marengo' (1804) and the 'Morning of the Battle of Austerlitz' are among his more famous productions; for the latter he received from Napoleon the cross of the Legion of Honour. He died at Paris, 27th November 1836.—**Émile Jean Horace V.,** son of the preceding, was born at Paris, 30th July 1789, and studied under his father, the draughtsman Moreau, the architect Chalgrain, and the painter Vincent. At fifteen years of age he was able to maintain himself by his drawings, and he soon struck out into a style of his own quite different from that of the dominant school. This indeed at first stood in the way of his success, and made him lose the travelling scholarship of the Academy, but before long he managed to secure the patronage of the court. He served as a soldier, and in 1814 received from Napoleon the cross of the Legion of Honour for gallant conduct at the Barrière de Clichy. In 1826 he was elected a member of the Institute, and in 1828 he succeeded Guérin as director of the French Academy of Arts in Rome, a post which he retained for seven years. During the rest of his life he was frequently abroad, visiting Algeria, Egypt, Syria, England, and even Russia and the Caucasus; but he had an estate at Hyères, a house at Versailles, and apartments at the Institute. He was widely patronised, and honours of many kinds were heaped upon him. He died January 17, 1863. His only daughter and child, who had married Paul Delaroche, had died eighteen years before. The success of H. V. was largely due to the fact that he had a keen power of observation and an accurately retentive memory, that his execution was easy and rapid, and that he was restrained by no conventional restrictions from painting what he saw and as he saw it. His battle-pieces are full of the fierce motion of the fight. Among the vast multitude of works which he has left it is difficult to choose. The battles of Jemappes, Valmy, Hanau, and Montmirail (1817–23), the 'Barrière de Clichy' (1820), 'Mazeppa' (1825), 'Mazeppa and the Wolves' (1826), 'Cholera on Board the Melpomene' (1830), 'Judith and Holofernes' (1831), the 'Storming of Constantine' (1855), and the 'Battle of Isly' (1846), are among the twenty-two pictures which he exhibited at the Exhibition of 1855, and which procured him a grand medal of honour. See Durande, *Joseph, Carle, et Horace V.* (Par. 1865).

Ver'nier, a contrivance for measuring intervals much smaller than can be directly measured on a graduated scale. It was invented in 1631 by Peter Vernier, a Frenchman, and is now largely employed in graduated circles, barometer scales, &c. It consists, in its simplest form, of a small sliding scale, the graduated portion of which, equal in length to a given number of divisions on the principal scale, is divided into a number of equal divisions differing by one from the given number on the large scale. Thus if the chosen length on the large scale is divided into m parts, the V. of equal length is divided into $m + 1$ parts. Call this length a. Then each division on the large scale is $\frac{a}{m}$, and each division on the V. $\frac{a}{m+1}$. Hence if a dividing line on the V. is opposite a dividing line on the scale, the next line on the V. will fall short of the corresponding scale line by an interval equal

to the distance $\frac{a}{m} - \frac{a}{m+1}$, the next again will fall short of its corresponding scale line by twice this interval, the next again by thrice, and so on. But this difference is $\frac{a}{m(m+1)}$. Hence obviously by means of the V. we can measure intervals as small as $\frac{1}{m+1}$th of the smallest graduated interval on the scale. Thus, if it is desired to measure to hundredths of an inch, the V. must be made $\frac{9}{10}$ths of an inch long and then divided into 10 equal parts. Then the smallest measurable interval is $\frac{1}{10} - \frac{1}{10}$ of $\frac{9}{10} = \frac{10}{100} - \frac{9}{100} = \frac{1}{100}$. Instead of taking $m + 1$ V. divisions equal to m scale divisions, we may take $m - 1$. If it were desired to measure to hundredths of an inch on this modification, we should require to make the V. $\frac{11}{10}$ths of an inch long, and divide it into 10 parts. Then $\frac{1}{10}$ of $\frac{11}{10} - \frac{1}{10} = \frac{11}{100} - \frac{10}{100} = \frac{1}{100}$ is the smallest measurable interval. The practical method of using the V. will readily suggest itself when once the principle of its action is understood.

Ver'non, Edward, was born at Westminster, November 12, 1684, was well educated, and following a strong natural bent, entered the Royal Navy. He served in the battle of Vigo Bay, October 12, 1702, and with Sir George Rooke at Malaga in 1704, and soon got a captaincy. Made M.P. for Penryn (1727), and for Portsmouth (1734–41), he boasted in the House of Commons that he could take Porto Bello with six ships. Sent off with the specified number of vessels, he fulfilled his boast November 22, 1739. In 1741, however, he failed in his attack on Cartagena, but his popularity was undiminished, and he long represented Ipswich in Parliament. Smollett, who accompanied him to Cartagena, has immortalised the expedition in *Roderick Random*. In 1746 he was removed from the list of admirals, through a dispute with the Admiralty. He died at Nacton, Suffolk, October 29, 1757. V. published *A New History of Jamaica from the Earliest Account to the Taking of Porto Bello* (1740), and *Original Papers relating to the Expedition to Panama* (1744). See *The Life of Admiral V. by an Impartial Hand* (1758), and *Memorial from Contemporary Authorities*, by Wm. F. Vernon (1861).

Véron, Louis Desiré, a French journalist, born in Paris, 5th April 1798, took his degree of M.D. in 1823, and in 1824 received the appointment of physician to the royal museums, but in 1828 renounced his profession and obtained a post on the staff of *La Quotidienne*. He afterwards founded the *Revue de Paris* (1829), was director or lessee of the opera from 1831 to 1835, and acted as editor of *La Constitutionnel* from 1835 to 1856. In this last capacity he at first strongly supported M. Thiers, but after 1849 he became a partisan of the Bonapartes, and in 1851 loudly applauded the *coup d'état*. In 1852 he was appointed officer of the Legion of Honour. He died September 27, 1867. V.'s works are of interest and value for their piquant and pertinent details in regard to the social and political life of the times—*Mémoires d'un Bourgeois de Paris* (6 vols. 1854–56) and *Nouveaux Mémoires, &c.* (1866); *Cinq Cent Mille Francs de Rente: Roman de Mœurs* (1855), *Quatre ans de Règna: où allons-nous?* (1857); *Les Théâtres de Paris depuis* 1806 *jusqu'en* 1860 (1860).

Vero'na, an ancient city of N. Italy, province of the same name, picturesquely situated at the foot of the Tyrolese Alps, and on both banks of the Adige, 72 miles W. by N. of Venice by rail. It is a member of the famous Quadrilateral, having fortifications of unusual strength, and is interesting no less as a great centre of historical associations than as a celebrated home of art, rich in classical and medieval monuments of architecture. The Adige is here crossed by five bridges, and on the tongue of land on the W. side lies by far the greater part of the city. Foremost among the antiquities is the amphitheatre, probably erected under Diocletian (A.D. 284), and which brings out in its full perfection the massive grandeur of the true Roman style. It is 106 feet high and 528 yards in circumference, and rises in 45 tiers of grey marble steps, capable of accommodating 25,000 spectators sitting, and 70,000 standing. Most of the outside range of arches is lost, but the internal seats have been wonderfully preserved by a custom of repairing them which has gone on unbrokenly through all the ages, and which has become a part of the history of the building. Another antiquity, the great gate of V., the Porta de Borsari, now spanning one of the busiest streets, was erected by Gallienus in A.D. 265. Among other Roman remains is the Arco dei Leoni. In the architecture of V. there is a gap extending from the 3d to the 12th c. from the amphitheatre in the days of Diocletian to the church of San Zeno in the time of Friedrich Barbarossa. The latter edifice is the great example of what Freeman very aptly calls 'the barbaric form of Italian Romanesque.' The nave in its present form was begun in 1139, and the choir dates from the 13th c. A notable feature is the great Campanile; the projecting portal rests on lions of red marble, the interior has an open roof supported by fine pillars and columns. The cathedral of Santa Maria Matricolare is an imposing Gothic structure of the 14th c. At the portal are Roland and Oliver, the paladins of Karl the Great, and over the altar is a celebrated Assumption by Titian. The little church of St. Stephen on the E. or Theodoric's side of the river at one time disputed with the great *Duomo* the first place among the churches of V., as the seat of her bishops in life, and their resting-place in death. Other notable churches are the Gothic S. Anastasia (begun 1261), with marble façade; S. Giorgio in Braida (1604), designed by Sammichelfi, and adorned with pictures by Tintoretto, Veronese, &c.; S. Fermo Maggiore, of the 14th c., with rich interior; and S. Nazzaro e Celso, a work of the Renaissance. V. has many fine palaces, including the Palazzo del Consiglio ("La Loggia'), restored in 1873, with statues of famous Veronese, comprising Cornelius Nepos, Catullus, Vitruvius, the younger Pliny, Æmilius Macer, &c.; and the Palazzo Pompei alla Vittoria, now containing the Civic Museum and valuable picture-gallery. A unique Gothic structure is the tomb of the Della Scala family, who were presidents of the republic of V. for upwards of a century. On the left bank of the Adige rises the Castello S. Pietro, the stronghold of Theodoric, which was remodelled by Galeazzo Visconti in 1393, and which, after being dismantled by the French (1801), was refortified by the Austrians in 1849. The adjoining Giardino Guisti is noted for its venerable cypresses, some of which are over 400 years old, and attain a height of 120 feet. The seat of a bishop, a prefect, a tribunal, a commander-general, &c., V. has numerous educational and benevolent institutions. There is an important transit trade with Germany, and among the leading manufactures are silks, woollens, cottons, musical instruments, furniture, &c. Pop. (1876) 66,086. V. is one of the oldest towns of Italy, its earliest inhabitants being either the Euganei or the Celtic Cenomani. It became a flourishing colony under the Romans. Here Decius defeated the Emperor Philip in 249, Constantine overthrew the army of Maxentius in 312, and Stilicho hurled back the hosts of Alaric in 403. After his defeat of Odoacer (489) at V., Theodoric made it his alternative residence, and it was subsequently called Wälsch-Bern, or Dietrichs-Bern, to distinguish it from 'V. in montibus.' The city suffered during the Ghibelline wars, but prospered under the Scaligers (1262–1387), who were succeeded by the Visconti and Carrara families. It escaped the tyranny of hereditary rulers by transferring its allegiance in 1405 to Venice, whose fortunes it subsequently shared. See Perini's *Storia di V. dal* 1790–1822 (3 vols. Ver. 1873–75).

Verone'se, the name conferred on the great painter, **Paolo Cagliari,** from his birthplace, Verona, where he was born in 1530. A sculptor's son, he studied painting under an uncle, Antonio Badile, and was early summoned by Cardinal Gonzaga to decorate the cathedral of Mantua, where his 'Temptation of St. Antony' outdid the efforts of three fellow-artists from his native town. In 1555 he came to Venice, and entered upon his noble rivalry with Titian and Tintoretto, forming with them the mighty Venetian Trio, each of whose members preserved his own ideal—Titian pure loveliness, Tintoretto Titanic fury, V. material gorgeousness. His adornment of the church of S. Sebastiano with the 'Story of Esther,' of the Doge's palace with the 'Apotheosis of Venice,' and of the refectory of S. Giorgio-Maggiore with the matchless 'Marriage at Cana,' his winning with the allegorical 'Music' a golden chain awarded to the best design for the library of S. Marco, his journey to Rome in the ambassador Grimari's train, and his revisit to Verona—those are the scanty known facts in a career that closed with the painter's death at Venice, April 19, 1588, and with his burial in S. Sebastiano. But the life itself lives on his numberless vast canvases, where, be the subject sacred or profane, historic or allegorical, we see the scenes and men looked on by V. Thus

his 'Marriage at Cana' (now in the Louvre) contains portraits of himself, Tintoretto, Titian, and Bassano, as well as of François I., Karl V., Suleiman II., Vittoria Colonna, and Mary of England; another instance is furnished by the curious *procès-verbal* (1573), unearthed from the Venetian archives by M. Baschet in 1873. In it he justifies himself to the Inquisitors for introducing into a 'Last Supper' a jester with a parrot on his wrist, halberdiers, dressed in the German fashion, eating and drinking at the foot of a stately staircase, and one of the Apostles picking his teeth with a fork. Purple and fine linen, superb voluptuous dames, stalwart young signors, and crowded palaces, were V.'s *forte;* his paintings have all Rubens' pride of the eye, little of Rubens' lust of the flesh. Many were reproductions, thirteen depicting the 'Adoration of the Magi,' five the 'Entombment,' five the 'Crucifixion,' and four the 'Marriage,' while single masterpieces by him were the 'Rape of Europa,' 'Jupiter Fulminating against the Vices,' 'St. Jerome,' and the 'Supper in the House of Levi.' The National Gallery has six of his works—the 'Consecration of St. Nicholas,' a study for the 'Rape of Europa,' an 'Adoration of the Magi,' the important 'Family of Darius at the Feet of Alexander,' the 'Magdalen Laying Aside her Jewels,' and 'St. Helena: the Vision of the Invention of the Cross,' this last a splendid acquisition of 1878, well worth the outlay of over 3000 guineas. Among the disciples of V. were his brother Benedetto, his sons Carletto and Gabriele, and a nephew, Luigi dal Friso. See chap. vii. of Symonds' *Renaissance in Italy: The Fine Arts* (Lond. 1877), and Crowe and Cavalcaselle's *History of Painting in N. Italy* (Lond. 1871).

Veron'ica. See SPEEDWELL.

Veron'ica, St. See CHRIST, PICTURES OF.

Versailles, one of the finest and most famous cities of France, capital of the department Seine-et-Oise, 11 miles S.W. of Paris by rail. Standing on a plain, it is formed of broad, straight streets, intersected by elegant, tree-shaded avenues. Long the residence of the splendid court of France, it became the seat of the National Legislature in 1871. It is still the seat of a bishop, a prefect, an assize court, and a tribunal of the first instance; and, besides its grand historical palace, has many handsome private buildings, eight churches, including a cathedral, a Lutheran and an Anglican church, a theological seminary, a lyceum, an école normale (with botanical garden), a drawing-school, a school for German and English, a public library of 60,000 vols., a national museum, an old hospital (1350), &c. In former times V. flourished amid the luxury of its court, and even yet it is greatly dependent on the visitors who are attracted hither by the climate and surroundings, as well as by the lowness of its prices compared with those of Paris. There are, however, some manufactures of watches, arms, tools, iron and copper wares, Cashmere shawls, cotton goods, starch, needles, coloured papers, porcelain, &c. Pop. (1876) 49,847, including the garrison. The history of V. is that of its famous palace. The site was originally occupied by the priory of St. Julian, which dated from early Capetan times, and the first superior of which was *Hugo de Versallis*. In the 11th c. the priory was turned into a stronghold, and in 1627 was occupied as a chateau by Louis XIII. Reconstructed and enriched by Louis XIV., it continued to be a usual residence of the court down to the Revolution, the early scenes of which took place here in the meeting of the States-General in May 1789. Standing amid wide-spreading gardens adorned with fine fountains and statues, the palace is 1400 feet long by 260 broad, and contains valuable art collections. V. was the headquarters of the German army from 5th October 1870 to 13th March 1871, and in the great *Galerie des Glaces* King Wilhelm was proclaimed Emperor of Germany. The Legislature determined to remove its seat from V. to Paris by a vote of both chambers in March 1879. See Eckhard, *V. Ancien et Modern* (Par. 1840); Gavard, *Galeries Historiques de V.* (13 vols., Par. 1835-44); and Supplement (6 vols., 1847-49).

Verse (Lat. *versus*, from *verto*, 'I turn;' *cf.* Gr. *stichos*, 'a row'), in poetry, a line which, according to the nature, number, and arrangement of its feet, is termed an hexameter, pentameter, iambic, &c. V. also is sometimes used improperly for 'stanza,' or for 'poetry' generally. The versicular division of the Scriptures was confined in the oldest MSS. to such metrical portions as the Songs of Moses, Hannah, and Simeon; and its application to the whole Bible was adopted from the Masorites by the Dominican Sanctes Pagninus in his Latin translation (Lyon 1528).

Versecz', a town in the comitat of Temes, Hungary, 46 miles S. of Temesvar by rail, has several theological institutions in connection with the Greek Church. Silk, wine, and rice are the chief products, the annual supply of wine exceeding 11,000,000 gallons. Pop. (1869) 21,095. On 19th January 1849, V. was the scene of a severe defeat inflicted by General Todorovich upon the Hungarian insurgents.

Verst, a Russian measure of length, equivalent to 3500 feet, or about two-thirds of an English mile.

Vert. See HERALDRY.

Ver'tebra. See SKELETON, SKULL, and SPINE.

Ver'tebral Col'umn. See SPINE and SPINAL COLUMN.

Vertebra'ta, the highest sub-kingdom of animals, including the fishes (*Pisces*), frogs, &c. (*Amphibia*), reptiles (*Reptilia*), birds (*Aves*), and mammals or quadrupeds (*Mammalia*). The most characteristic of the features by which V. are distinguished from Invertebrata (q. v.), are the specialisation of the chief nervous centres, and their peculiar relation to the other systems of the body. See DEVELOPMENT OF EMBRYO.

Verti'go, in medicine, designates a sensation of giddiness without loss of consciousness. Two kinds of V. are described, one depending upon visceral irritation and another upon a morbid condition of the auditory apparatus. The first, which is termed *Stomachic* V., is probably dependent upon a reflex excitation of the cerebral vessels from some visceral irritation, and frequently occurs after a hearty meal, though sometimes when the stomach is entirely empty. There is first slight headache, buzzing in the ears, palpitation, sometimes hallucination, followed by giddiness. Tape-worm (q. v.) is a frequent cause of V. For the treatment of stomachic V. Trousseau recommends a glassful of quassia infusion every morning, and after each meal a powder containing bicarbonate of soda and calcined magnesia, five grains of each, and ten grains of chalk powder. Strychnia, pepsine, and bismuth may be given also. *Auditory* V., sometimes called Ménière's disease, is a morbid cerebral condition expressed by V. and rotatory motions dependent upon disease of the labyrinth, or other parts of the central auditory apparatus. Ménière was the first to describe the disease. There are generally some prior indications of otitis, a sensation of nausea and buzzing in the ears. The patient sways or reels, and there is a tendency to turn from the left to right when the left ear is affected, and *vice versa* when the other ear is affected.

The pathological conditions giving rise to *auditory* V. have been recently investigated by Flourens, Goltz, Brown-Sequard, and still more recently by Ferrier and Crum-Brown. Brown-Sequard illustrates the relation of rotatory movements to auditory irritation as follows:—'(1) Any one who has received an injection of cold water in the ear may know that it produces a kind of V., and that it is difficult to walk straight for some time after this irritation. (2) A sudden noise makes the whole body jump, particularly in old people, or in persons attacked with anæmia, chlorosis, epilepsy, chorea, hysteria, hydrophobia, and in certain cases of poisoning; in a word, in all circumstances in which the control of the will over reflex actions is lost or diminished. (3) V. and various convulsive movements in cases of irritation of the acoustic nerve have been observed in adults and children. Rotatory movements have taken place in cases of suppurative inflammation of the ear, and twice immediately after an injection of nitrate of silver.' A perfect condition of the labyrinth is necessary to the preservation of the power of equilibrium, as it seems to regulate that condition, and to preside over co-ordination. See *Leçons sur les Maladies du Syst. Nerv.*, No. 4, by M. Charcot; *On the Functions of the Brain*, by Dr. Ferrier (Lond. 1876); *British Medical Journal*, August 26, 1876, and March 16, 1878; *On Deafness, Giddiness, and Noises in the Head*, by Edward Woakes (Lond. 1879).

Ver'tue, George, an English engraver and antiquary, was born in Westminster in 1684, studied under Michael Vandergucht for seven years, and in 1709 started in business for him-

self. His first patron was Sir Godfrey Kneller, who warmly befriended the young artist. An engraved portrait of Archbishop Tillotson at once secured him a high reputation. Another of George I. issued immediately after his accession was extraordinarily popular. In 1717 he was elected engraver to the Society of Antiquaries, and worked in their service till his death, 24th July 1756. V.'s engravings, which are very numerous, are historically valuable on account of their accuracy, but they lack spirit. An enthusiastic antiquary, he made frequent journeys through England to draw churches, monuments, and ruins. For more than forty years V. was engaged in collecting materials for a *History of the Arts in England*, which came into the hands of Horace Walpole, and were copiously used by him in his *Anecdotes of Painting in England* (5 vols. 1762). A complete list of his works—the portraits alone are upwards of 500—will be found in Walpole's *Catalogue of Engravers*.

Vertum'nus. See POMONA.

Ver'vain (*Verbena*), the type-genus of *Verbenaceæ* (q. v.), consisting of about 80 species of herbs or undershrubs scattered over tropical and sub-tropical regions, especially those of the New World. *V. officinalis*, the only representative of the genus and of the order belonging to the British flora, is a local plant of dry waste ground in the English counties. This species was an object of much superstition among the ancients—Persians, Greeks, Romans, and Druids—and was supposed to possess remarkable virtues. Various species, and innumerable gardeners' varieties, of *Verbena* are extensively cultivated as ornamental plants or for their fragrance, such as *V. chamædrifolia* from S. America, and *V. triphylla* or *Aloysia citriodora*. The 'oil of verbena' of perfumers, so much prized for its lemon-like scent, is extracted from a grass, and not, as its name implies, from a species of V.

Ver'viers, a town of Belgium, province of Liege, in the valley of the Vesdre, 16 miles E.S.E. of Liege by rail. It consists of an upper and a lower town, is regularly built, and has a fine town-house, a theatre, a large public library, and a picture-gallery. V. is the frontier station of the Rhenish and Belgian railway, and, as the centre of the cloth manufacture, may be called the Leeds of Belgium. Besides its extensive cloth and cassimer manufacture, it has wool-carding and dyeing, soap and vitriol boiling, tanning, brewing, machine-making, and metal-founding. Pop. (1874) 47,311.

Ver'wick, a town in the province of W. Flanders, Belgium, close to the French frontier, and 10 miles N.W. of Courtray by rail. It has large tobacco manufactures. Pop. (1870) 6758.

Vesa'lius, An'dreas (the Latinised form of **André Vesale** or **Wesel**), one of the great founders of modern anatomy, was born at Brussels, December 31, 1514. Educated in grammar at Louvain, he began his anatomical studies at the age of fourteen under Dubois at Paris; and so rapid was his progress that in his twenty-second year he was asked to demonstrate publicly in the university of Padua. At length the result of his labours, carried on at Venice, Pavia, Bologna, Pisa, and Basel, appeared at Basel in 1543 as a folio volume illustrated with plates, *De Humani Corporis Fabrica*. Soon afterwards called to be physician to Karl V., he accompanied the emperor on his journeys and campaigns; and on Karl's abdication he passed into the service of Philip and settled at Madrid. Here, however, he was more than ever exposed to the attacks of his professional opponents, and at length he was brought before the Inquisition and condemned to death. The influence of the king secured his pardon on condition that he undertook a pilgrimage to the Holy Land. On his way back in 1564 he was wrecked on the island of Zante, and died in such penury that he was indebted to the charity of a stranger for his burial. Not only did V. make many important discoveries and correct many errors in his favourite science, but he greatly accelerated its progress by relieving it from the trammels of the Galenian traditions, and by substituting the dissection of the human body for that of the lower animals. His *Opera Omnia* were published by Boerhaave and Albinus (Leyden 1725), and his Life has been written by Burggrave (Ghent 1841), Mersman (1845), and Weynants (Löuv. 1846). His *Tabulæ Anatomicæ Sex* (Ven. 1538), the first contribution which he made to the popularisation of anatomy, were reproduced by lithography for Sir William Stirling-Maxwell in 1875. A contemporary portrait of V. was discovered in the Louvre in 1876.

Ves'ica Pis'cis (Low Lat. 'bladder-fish'), the name applied by Albert Dürer to an almond-shaped or pointed oval figure, such as was sometimes given to aureoles, medieval seals, and window traceries. English antiquaries have conjectured that the name was due to a supposed resemblance of the figure to the symbolical fish or Ichthus (q. v.).

Vesicula'ria, a genus of Lower *Mollusca* or *Molluscoida* (q. v.), belonging to the *Polyzoa* (q. v.), included in the group *Ctenostomata* (q. v.). In this group, the cells of which the organism is composed arise from a common tube, and the cell mouths are terminal in position.

Vesoul', capital of the department of Haute-Saône, France, on the Dugeon, at the foot of Motte-de-V., 74 miles S.E. of Chaumont by rail. It is well built, with wide streets. A church of 1745 and the *Palais de Justice* (1765) are the principal buildings. There is a public library, with 26,000 vols. V. has tanneries, turning-mills, basket manufactories, weaving, and trade in salt, but agriculture is the main industry. Pop. (1872) 6313.

Vespasia'nus, T. Flavius Sabinus, a Roman emperor, was born near Reate in the Sabine country, November 17, A.D. 9. Previous to his consulship in 51 he had successively filled the posts of military tribune in Thracia, of quæstor in Crete and Cyrene, and of commander of a legion in Germany and Britain (A.D. 43). Under Nero he was proconsul in Africa, and in 66 he was despatched by this emperor to carry on a war against the Jews. On Nero's death (68) the throne was held in rapid succession by Galba, Otho, and Vitellius. The last of these was hardly secure of his position when V. came forward as his rival, and supported as he was by the legions of the East he soon carried all before him. Rome was seized by his generals, and in December 21, A.D. 69, Vitellius was put to death. The reign of V. is remarkable in three distinct aspects—as a period of military glory, of architectural splendour, and of literary culture. There were three great wars, the war with Civilis in Germany, the war with the Jews, and the war in Britain, and in all three the emperor was served by able generals. The German leader was finally defeated (70) by Cerealis; in the same year the city of Jerusalem was captured and laid waste by Titus, the emperor's own son; and before the close of the reign Agricola had subdued the British as far N. as the Tyne and the Solway. In 71 the temple of Janus was closed, and V. began to build his celebrated Temple of Peace; and though it was not completed till the reign of Domitian, it is to V. that the chief credit is due for the matchless Colosseum or Amphitheatrum Flavianum. Tacitus and Pliny are the two great writers of the period. Of his humble origin V. was never ashamed, and to the last he showed affection for the scenes of his early days. He died 24th June, A.D. 79, and was succeeded by his son Titus. An interesting relic of his reign is the *Lex de Imperio Vespasiani* or *Lex Regia*, by which the empire was formally placed in his hand by the Roman senate, the bronze tablets of which, discovered in 1347, are now in the Capitoline Museum. It was on this law that the Roman revolutionary, Rienzi, professed to found some of his claims. See A. G. Cramer, *F. V.* (Jena 1875).

Ves'pers, so called from Vesper, the evening star, was also called *hora lucerna* ('lamp hour'). Originally, like that of all the Canonical Hours (q. v.), of which at first it was the last, the service consisted of the singing of three psalms intermixed with some prayers. According to the account of all the services given in the Apostolic Constitutions, that for V. opened with the 140th (141st) Psalm, which was followed by a prayer. A collect was next said by the bishop, and a benediction pronounced on the people, who were then dismissed. But different churches had different usages, and in some, lessons were read, hymns sung, and other prayers offered.

Vespertil'io. See BAT.

Vespucci. See AMERIGO VESPUCCI.

Ves'ta, an ancient goddess, was called Hestia by the Greeks. According to the traditions of that people she was a virgin divinity, and watched over the fire that burned on the household hearth, which was looked upon as her shrine. Something sacred attached to this part of the house. It was the family altar; here suppliants took refuge; on it oaths were sworn. Each town had its public fire, which was left continually burning in the Prytaneum; and when a band of colonists went forth from

the city, they carried fire lighted at the common hearth with them. At Rome it was believed that Æneas had brought in this manner the sacred fire from Troy. It was preserved in a temple of circular shape with vaulted roof, which stood on the Forum. The sacred fire therein was tended by six priestesses who were called *Vestales*. They were virgins like the goddess whom they served. They performed several important functions in the state religion of Rome. They assisted at all great public rites, and were present at such religious transactions as the consecration of temples. Their fixed term of service was thirty years, of which they passed ten in a state of noviciate, ten in performing the sacred duties of their office, and ten in instructing novices. After this they were permitted to return to ordinary life if they pleased, though this was a privilege of which few availed themselves; for notwithstanding the drawbacks and restrictions of their position, it was one of great honour and even profit. Lictors preceded them when they appeared in public; consuls and prætors saluted and made way for them. They were maintained at the public expense, and they occupied special places of honour at the public games. If any proved unfaithful to her vows, she met with a terrible fate. She was degraded and deprived of her insignia of office. She was then dressed like a corpse, placed in a close litter, and conducted with all the usual ceremonies attendant on a funeral to a piece of ground called the Campus Sceleratus, where she was buried alive. If the sacred fire of the goddess was allowed through negligence to go out, it was rekindled by the Pontifex Maximus by the friction of two pieces of wood against each other. The festival of V. was celebrated on the 9th of June in each year, on the 15th of June the temple was cleaned and purified, and on the 1st of March the sacred fire and the laurel tree that shaded it were renewed.

Vest'ments, Sa'cred. Ministers of religion have everywhere, and at all times, been distinguished by some peculiarity of dress. In the Christian Church the first garment that began to have something of a distinctive nature was a mantle whch was generally worn by philosophers and their disciples, and was adopted by Christian ascetics—*pallium asceticum* (see PALL)—but the use of which was given up in the 6th c. In the 5th c. mention is first made of a 'religious habit,' or a special dress for the clergy. They were still more clearly distinguished from the laity during the 6th c., when the latter began to imitate, in the style of their dress, the barbarians who had overrun Europe, while the clergy generally preserved the more grave and dignified Roman costume. As regards special garments to be worn by the clergy while engaged in discharging their peculiar functions in the conduct of public worship, &c., a distinction gradually arose between them and the common dress of the laity simply by the avoidance of new fashions and the use of richer materials. (See CHASUBLE, DALMATIC.) From the 4th c. to the 9th c. the material of which they were made was for the most part white; after that other colours were gradually introduced, and after the 11th c. the five colours were definitively adopted which are used to the present day—white, red, green, violet, and black. The S. V. worn by priests in the Roman Catholic Church at the celebration of Mass are six in number—the Alb (q. v.), Amice, Cincture, Maniple, Stole (q. v.), and Chasuble (q. v.). See Martigny, *Dict. des Ant. Chret.* (new ed. Par. 1877).

Ves'try. See PARISH.

Vesu'vian, or **I'docrase**, a mineral originally detected in the volcanic débris of Mount Vesuvius, is very closely allied to the garnet, agreeing with it in chemical composition, but differing in the form of its crystals. It is a silicate of lime and alumina; specific gravity 3·3, and hardness about 5·5. In colour it varies from green to dusky brown, and specimens of the latter hue are sold in Naples under the name of *gemmes de Vesuve*.

Vesu'vius, of all volcanoes the most famous in history, rises a solitary peak from the Campanian plain, which stretches along the N.E. shore of the Bay of Naples in Southern Italy. It lies nearly due E. of the city of Naples, and its western slope rises from the sea at an angle of 10°. The central cone, with a gradient of from 30°-35° and a height of nearly 4250 feet, is separated by the *Atrio del Cavallo*, a deep sickle-shaped valley, from *Monte Somma*, a crescent-shaped ridge on the N.E. of the mountain. Monte Somma attains its maximum height in the *Punta del Masone* (3642 feet), rising abruptly from the Atrio del Cavallo, but sloping gradually down to the plain on the N. Eighteen centuries ago V. presented a very different appearance from what it does now. The slopes were clothed with verdure and covered with vineyards. There was no cone, but the summit, mainly level, was sterile and charred, suggesting to Strabo the geographer, to whom we are indebted for our knowledge of its appearance, its probable volcanic origin. Within sixty years after his death, in the year 79 A.D., the first known eruption occurred, devastating the country for miles round, and completely overwhelming in ashes and lava Pompeii (q. v.), Herculaneum (q. v.), Stabiæ, and other villages of the district. Of the subsequent eruptions, which have continued to take place at intervals, the most violent were those of the years 203, 472, 512, 685, 982, 1036, and 1139. Between 1500 and 1631, V. was in a state of quiescence, but in December of the latter year a terrific eruption occurred, projecting stones and ashes to great distances, and pouring down lava streams upon the villages which nestled at the mountain's base. Other eruptions followed in 1638, 1660, 1680, 1707, 1737, 1760, 1767, 1779, and 1794, during which succession of disturbances the summit underwent marked alterations in aspect. The eruption of 1794 was remarkable for its lava streams, many of which poured into the sea, heating the water to a considerable extent. During the present century eruptions have taken place in 1804, 1805, 1822, February 1850, May 1855, June 1858 (when the cone sank 195 feet below its former elevation), December 1861 (when Torre del Greco was again devastated), and November 1865. This last one was comparatively mild, and came to an end in November 1868. In January 1871 the mountain began to show symptoms of a renewal of disturbance, and early in the succeeding year the eruption gradually increased in violence till April 14, when lava burst forth on all sides, one tremendous stream being 1000 yards wide and 20 feet deep, and flowing in 12 minutes to a distance of three miles. A detailed account of this eruption has been published by Palmieri, the director of the Meteorological Observatory, which is built on a shoulder of the hill at a height of 2218 feet above the sea-level. In 1877 the mountain, after a period of complete quiescence, began to emit fire and flames, and has continued to do so with varying activity for over two years. In October of 1878 the eruption attained a maximum, but was unaccompanied by any of the horrors which characterised that of 1872. At present there are indications of increased activity. A scheme, proposed by a Neapolitan banker, for constructing a railway from Naples to the margin of the crater, has lately been adopted and put into execution. The waggons, which are each to contain 16 persons, will be dragged up the incline by means of a rope, and will be provided with a patent brake for stopping them instantly should the rope happen to break. See Phillip's *History of V.* (1869), Palmieri's *Eruption of V.* (1872), and Rath's *Der V.* (Berl. 1873).

Veszprim (Ger. *Weissbrunn*), a town of Hungary, at the N. end of Platten See, 22 miles W. of Stuhlweissenburg by rail. In the centre of the town is a precipitous chalk hill, which formed a valuable fortress in the wars with the Turks. On this hill are the cathedral, a magnificent building of the 14th c., and the episcopal palace with the chapel of Queen Gisela. V. has also a gymnasium, a college of the Piarist monks, and a tall minaret—the only relic of Turkish occupation. Breweries, corn-mills, flannel-weaving, spinning, and iron-works are the chief industries. The vine is cultivated. Pop. (1869) 12,100. V., which under the Romans had the name of *Cimbriana*, was once a royal residence. The Hungarians took it in 1491, the Turks in 1552, and it was joined to the empire in 1683.

Vetch, or **Fetch,** or **Fitch,** used absolutely, means the fodder-plant *Vicia sativa*, but serves also as an English name for the genus *Vicia*. This genus, belonging to the *Papilionaceæ* suborder of *Leguminosæ*, consists of about 100 species of climbing or diffuse herbs, distributed through temperate regions of the N. hemisphere and S. America. The common Bean (q. v.) is frequently classed under *Vicia* as *V. Faba*. The next most important species is the V., or Tare of agriculturists—the *V. sativa* above mentioned. It is one of the best fodder-plants, but is only of one or two years' duration; it is important also for green-manure, and as a companion-crop with clovers. The practice of sowing it along with oats or barley is strongly recommended, insuring a greater bulk of produce, and preventing the crop from massing and rotting in wet weather. *V. Cracca*, or the tufted V., *V. peregrina*, *V. sepium*, *V. sylvatica*, and various species of

the same group as *V. sativa*, are all relished by cattle, and some of them are cultivated in S. Europe. Twelve species of *Vicia* (including therein *Ervum*) are natives of Britain. See TARE.

Vetch, Bitter. See OROBUS.

Vetch'ling. See LATHYRUS.

Vet'eran, an old soldier. The word is derived from *veteranus*, a soldier in the Roman militia who had served several campaigns, and who was therefore entitled to certain benefits and privileges. In modern usage it is applied very similarly—viz., to soldiers who have retired from the army after long service, and who are only liable to be called up in case of national emergency. V. corps form useful adjuncts to the military power of a country, and are particularly suited for garrison duty, and for supplying at home the place of the army in the field.

Vet'erinary Med'icine (Lat. *veterina*, 'beasts of burden') may be defined as that branch of medical science which embraces the treatment of diseased domestic animals, and the preservation of their health. V. M. has evidently been practised from the earliest times; and there is every reason to suppose that the study of disease in the inferior animals was applied, on comparative principles, to the treatment of disease in the human subject. For many centuries, the inferior animals alone were used for purposes of scientific dissection. Among the Greeks, the study of the diseases of domestic animals, and of the remedial agents applicable to such diseases, was directly applied to the practice of medicine, and it was compulsory on anyone making a new discovery regarding such curative agents, to divulge it for the public good. Physicians were presumed to be acquainted with V. M., and Hippocrates, the most celebrated physician of early times, wrote a treatise on the curative treatment of horses. Columella (q. v.) and Vegetius, Latin authors, the latter of whom flourished about 300 A.D., wrote books on V. M., which contain an epitome of the best of all that was previously known. In the Middle Ages, however, V. M. was utterly neglected, and desolating plagues swept away nearly the entire herds and flocks of the countries they visited, precisely as the great epidemics of the Middle Ages swept away vast numbers of human beings, almost depopulating many of the provinces of Europe. Indeed, cattle-plagues were not infrequently the forerunners of great epidemics, and although they may have had no connection as cause and effect, they may have had some co-relation, as affecting the food-supplies of human beings and ushering in periods of famine, which would give intensity to epidemic diseases. During the 16th c. V. M. became again a subject of study, and the Constantine collection of works were translated from the original Greek into Latin by the order of François I., and from the Latin they were soon afterwards translated into Italian, French, and German. During the 17th c., the more important works which appeared were Fiarchi's Italian treatise on *Horsemanship*, and the *Infermita e Suoi Remedii, del Signor Carlo Ruini*, published in Venice, 1618. In 1654 the *Grand Marſchal François* was published; and, towards the close of the century, the elaborate work of Sollysel. In Great Britain, Blundeville and Gervase Markham published works on farriery; and Snape, farrier to Charles II., published an anatomical treatise on the horse, his plates being copied from those of Ruini. The 18th c. produced numerous authors on V. M., more especially in France, an impetus having been given to the study by the establishment in 1761, under royal patronage, of the Veterinary Seminary at Lyon under Professor Bourgelat. In 1766 another school of V. M. was opened at Alfort, near Charenton; and others were subsequently opened at Strassburg and Montpelier, and in almost every European city of note, as Vienna, Dresden, Leipzig, Berlin, Copenhagen, Prague, Munich, Hanover, Naples, London, &c. In 1754 La Fosse, a contemporary of Bourgelat, published his numerous memoirs in one volume, which was soon afterwards translated into most of the European languages. The most celebrated French writers of the beginning of the present century are Chabert, Flandrin, Gilbert, Vicq-d'-Azyr, and Huzard. In the reign of George I., Sollysel's work was translated from the French into English by Sir William Hope; and, about the middle of the last c., Gibson, who was formerly surgeon to a regiment of cavalry, published his treatise on farriery, the best which had then appeared in the English language. The other writers on V. M. of this period are Bracken, Bartlet, and Osmer, who had been educated as medical practitioners.

In 1791 the Veterinary College of London was instituted under the presidency of the Duke of Northumberland. During the present reign a charter has been granted to the veterinary body at large, forming a Royal College of Veterinary Surgeons, empowered to examine candidates and grant diplomas. In 1819 the first course of lectures on V. M. in Scotland was delivered by Mr. Dick, and a systematic course under the auspices of the Highland and Agricultural Society and the Senatus Academicus of Edinburgh in 1823. At his death, in 1866, Mr. Dick bequeathed to the city of Edinburgh his entire fortune, to be devoted to the teaching and improvement of V. M. In 1857 Mr. John Gamgee established a new veterinary college in Edinburgh; and since 1861 a veterinary school has been conducted in Glasgow by Mr. James Macall.

Previous to entering a veterinary college a matriculation examination must be passed in English reading, English grammar, writing to dictation, and arithmetic; and, in addition to these subjects, candidates may be examined in Latin, Greek, French, and German if they wish. During the first year, lectures and demonstrations are received in chemistry, toxicology, materia medica, pharmacy, botany, and also in anatomy; during the second year, in general and special anatomy, physiology, histology, medicine and surgery, and dissections; and during the third year, in V. M. and surgery, demonstrations on morbid anatomy and pathology, clinical and general instructions. At the end of each session the student has to undergo a searching professional examination. The following are the more important works recently published on V. M.: *Handbuch der Veterinär-Polizei*, by Haubner (Dresden 1866), *Lehrbuch der Pathologie und Therapie der Hausthiere*, by Röll (Vienna 1860), *Nouveau Dictionnaire Pratique de Médicine, &c. Veterinaires* (Par.), *Principles and Practice of Veterinary Surgery*, by Professor Williams (Edin. 1872), *The Anatomy of the Domesticated Animals*, by M. Chaveau, translated by Mr. Fleming (Lond. 1873), *Animal Plagues*, by Mr. Fleming (Lond. 1871), *Manual of Veterinary Sanitary Science and Police*, by Mr. Fleming (Lond. 1875), *Veterinary Obstetrics*, by Mr. Fleming (Lond. 1878).

Vet'erinary Sur'geon. The class certificates of the recognised veterinary colleges qualify for examination for the diploma of the Royal College of Veterinary Surgeons, the Highland and Agricultural Society's veterinary certificate for appointment in the army and Government portal inspectorships in England, Scotland, and Ireland. A V. S. in the army is an officer of a cavalry regiment, or in the artillery, who is charged with the supervision of the horses, and with their treatment when sick. Previous to admission he is required to produce evidence of qualification, and to pass an examination. On appointment he receives 10s. a day, and ranks as lieutenant. By length of service and efficiency the pay may rise to £1, 3s. a day, and he may advance to the rank of major, and after twenty-five years' service he becomes entitled to retire on half-pay.

Vet'iver or **Kuss-Kuss** is the fragrant fibrous root of *Andropogon muricatus*, a swamp-grass occurring in India, where it is woven into screens for windows and doorways, and into palanquin covers. When sprinkled with water, an agreeable odour and coolness is diffused. The root has been used in medicine for a variety of purposes. In Europe the V. is laid in drawers as a perfume, and to keep away moths. It is remarkable for retaining its fragrance for many years. An oil extracted from it is used in perfumery.

Ve'to (Lat. 'I forbid'). In constitutional governments, the power of the executive to negative the resolutions of the legislature may be either absolute or negative. The *Liberum V.* of the kings of Poland (q. v.) was absolute, as also theoretically is the power vested in English sovereigns, last exercised by Anne in 1707. On the other hand, the V. of a king of Norway is merely suspensive, and presidents of the United States, though by the Constitution of 1849 they may return a bill to Congress with their objections, cannot prevent its becoming law if passed by two-thirds of the House of Representatives and Senate. See also TRIBUNES, and PATRONAGE, ECCLESIASTICAL.

Ve'tro di Tri'na, or **Lace Glass**, is a beautiful ornamental variety of glass made at Venice by enclosing small rods or threads of opaque glass within an object made of transparent glass so as to form a regular lattice pattern; and at each intersection an air bubble is shut in to give beauty and variety to the work.

Veuill'ot, Louis, a French journalist and author, was born in 1813 at Boynes in the department of Loiret. In 1838 a visit to Rome made him an ardent Roman Catholic. In 1843 he joined the staff of the *Univers Religieux*, and since 1848, as its editor-in-chief, he has continued to be the passionate representative of the Ultramontane party. The violence of his attacks on Napoleon's Italian policy led to the suppression of his journal in 1860, but it was restored in 1867. Apart from his editorial labours, V. is a voluminous author, and his *Mélanges Réligieux, &c.* (18 vols. Par. 1857-76), *Pélerinages de Suisse* (1839), *Les Parfums de Rome* (1861), and *Les Odeurs de Paris* (1866), are among his more popular works. Charbonnel edited a collection of his finest passages in 1868.

Vev'ey, a favourite resort of visitors from all nations, first introduced to the world by Rousseau in his *Nouvelle Héloise*, is situated on the N.E. shore of the Lake of Geneva, occupying along with its eastern suburb, *La Tour*, a narrow strip of level ground between the vine-clad mountains and the lake, and commanding a magnificent view of the whole range of mountains which enclose the lake and the Rhone valley, from the Dent de Jaman and Tour d'Ay to Mont Velau, the Dent du Midi, and the Cornettis de Bize. Though the second town in the Canton de Vaud, V. cannot boast of any more imposing buildings than hotels and pensions. The church of St. Martin (1498) contains the remains of the regicides Broughton and Ludlow. Pop. (1870) 7887.

Vi'aduct (Lat. *via*, 'a way,' and *duco*, 'I lead'), a structure with open spans of masonry, brickwork, iron, or timber carrying a road above the level of the surrounding country. An *aqueduct* is a similar structure, but designed to serve as a watercourse. Viaducts are frequently employed to carry lines of railway across deep or wide valleys, or over existing channels of communication where embankments would be impracticable or inexpedient. The London and Greenwich railway (3¾ miles) runs over a continuous series of upwards of 1000 brick arches, and the London and Blackwall V. railway is nearly of equal length, and cost £1,083,950. The Crumlin V. (1800 feet long) in S. Wales is an interesting example of the iron-girder principle. Of timber viaducts in England, that on the Newcastle and Tynemouth railway, consisting of five wooden arches (each about 114 feet span) supported by masonry piers, is noteworthy; while two in the United States—one (2900 feet long) on the Richmond and Petersburg railway, and another (2200 feet in 10 spans) across the Susquehannah, are remarkable truss structures.

Via'na do Castell'o, a town in the province of Entre Douro e Minho, Portugal, 40 miles N. of Oporto, at the mouth of the Lima, which is crossed by a large wooden bridge. It is a clean and prosperous town, with a fort built by Philip II., and a good harbour. There is trade with Newfoundland in fish. In 1875 17 ships of 2041 tons belonged to this port. Pop. (1864) 6049.

Viardot-Garcia, Madame Michelle-Pauline, an operatic singer, daughter of Manuel Garcia (q. v.) and younger sister of Madame Malibran (q. v.), was born in Paris, July 18, 1821. She was a pupil of Liszt. She appeared as Desdemona in London in 1839, and proving herself a worthy successor to her great sister, soon obtained a European reputation. In 1840 she married M. Louis V., director of the Italian Opera in Paris. Perhaps her greatest successes were in Meyerbeer's operas, *Les Huguenots* and *Le Prophète*, as Valentine in the former, and as Fides in the latter. Her splendid voice had a compass of 3 octaves, and she shone in the concert-room, particularly in the rendering of Spanish songs, as conspicuously as on the stage.

Viareggio, a town of the Riviera, province of Lucca, N. Italy, 91 miles E. of Genoa by rail. It is a new town, and has grown rapidly of late years, and is much resorted to for sea-bathing. Near it are ruins of old Roman baths—the *Bagni di Nerone*. Pop. (1871) 9371.

Viat'icum (Lat. 'provision for a journey') was a name anciently applied both to the sacraments of Baptism and the Eucharist, because they were esteemed men's necessary provision and proper armour, both to sustain and conduct them safe on their way in their passage through this world to eternal life. Afterwards, however, it came to be applied more particularly to the Eucharist when administered to the sick who were in imminent danger of death, as a provision for their journey to the next world.

Viat'ka, a government of Eastern Russia, bounded N. by Vologda, E. by Perm, S. by Ufa and Kasan, W. by Nijni-Novgorod and Kostroma. Area, 59,114 sq. miles; pop. (1870) 2,406,024. Much of the surface is covered with hills of no great height, offshoots from the middle Urals, which are separated from each other by swamps and sandy wastes. About 76 per cent. is covered with wood, mostly the property of the crown. All the rivers of V. belong to the basin of the Kama. The geological structure of P. is uniformly marl, slate, and limestone of Permian formation. The inhabitants are principally occupied with agriculture (chiefly in the S., where rye, oats, barley, flax, and hemp are cultivated with success), horse and cattle rearing, fishing, lime-burning, and the manufacture of potash, tar, pitch, bast, sledges, and wooden fabrics, mill-stones and grinding-stones. Mining and smelting are also actively carried on. In 1873 there were within V. 100 factories, employing 23,548 men, and producing goods (principally leather, brandy, and iron fabrics) to the value of 11,680,305 rubles. V. sends corn, hemp, and lint to Archangel, and iron, copper, tar, pitch, wax, honey, and timber to Moscow, and to Nijni-Novgorod, Orenburg, and the other governments of the Volga.—**V.**, capital and centre of the trade of the preceding, on the river V., 220 miles N. of Kasan, has 18 churches, a famous monastery (founded 1580, which formerly possessed 24,000 serfs), and 16 factories, in which leather and wax, stearine and tallow candles are manufactured. Pop. (1875) 21,249.

Viaud, Théophile de, born in 1590 at Clairac in Agenois, came to Paris in 1610, and by his talents and sprightly wit secured the patronage of the young lords and choicest spirits of the day. With Balzac he made a tour in Holland, next entered the household of the Duc de Montmorency, and, after writing court ballets and masques, had a great success with the tragedy, *Pyrame et Thisbé* (1617). His fondness for satire made him enemies, who, coupling obscenity with the charge of heresy, procured his banishment (1619); but after a two years' exile in England he returned to Paris, and abjuring Calvinism followed the king on his campaigns of 1621-22. Persecution, however, soon recommenced, his attack on a single Jesuit rousing the hatred of the entire order; and for the filthy *Parnasse Satirique* (1623), published under his name but without his knowledge, if indeed he had any part in it at all, he was sentenced, first to death (1625), then to perpetual banishment. Montmorency obtained him leave secretly to return to Paris, where at the age of thirty-six he died in the duke's hôtel, 25th September 1626. Odes, sonnets, epistles, and elegies, fresh but fantastic, make up with vigorous prose the bulk of V.'s works, which, unduly exalted in the 17th c., fell in the 18th into complete oblivion, from which they were rescued by the Romanticists. See the preface to Alleaume's edition of them (2 vols. Par. 1856), and Théophile Gautier's *Les Grotesques* (Par. 1844).

Viaz'ma, a town of Smolensk, Russia, on the river V., an affluent of the Dnieper, 172 miles N.W. of Tula by rail, with 25 churches, and an active trade with Riga and St. Petersburg in corn, leather, hemp, and oil. Its gingerbread is sent to all parts of Russia. Pop. (1875) 11,637.

Vi'borg, a län of Finland, comprising that part yielded to Russia by Sweden by the treaties of Nystad (1721) and Abo (1743), lying S. of Karelia between the Gulf of Finland and the Lake of Ladoga. Area 1662 sq. miles; pop. (1875) 289,010 (88 per cent. Lutheran). The surface is mostly mountainous, but is marshy along the coast. The principal rivers are the Voxen and the Kymene. The inhabitants are occupied with agriculture, cattle-rearing, fisheries, and a coast transit-trade.—**V.** (Fin. *Viipuri*), the chief town, is situated in a marshy and unhealthy district on Tragösund, a bay in the Gulf of Finland, 74½ miles N.W. of St. Petersburg by rail. Founded in 1213, it is the seat of the governor of V., of a Lutheran consistory, and of the high court for the three governments of Kuopio, St. Michael, and V., has 4 churches, an old Gothic castle, manufactures of stearine, and a considerable trade in timber. Pop. (1875) 13,460.

Vi'borg, chief town of an *amt* of the same name in the peninsula of Jutland, Denmark, on the small lake of V., 33¾ miles W. of Randers by rail. It is one of the oldest towns in Denmark. Its cathedral, which dates from the 12th c., was rebuilt after the fire of 25th and 26th January 1726, which laid half the

town in ashes. V. has manufactures of leather and tobacco. Pop. (1870) 6500.

Vibrac'ula, the name given to the peculiar moving or vibratile filaments associated with the 'Birds' Head Processes' or *Avicularia* of the *Polyzoa*. Their nature is still undetermined, but some authorities believe them to be rudimentary *polypides* or *Zooids* (q. v.).

Vibur'num is a large genus of *Caprifoliaceæ*, consisting of shrubs and trees found through temperate and sub-tropical regions of the N. hemisphere, and on the Andean range in S. America. Two species are natives of Britain, namely, the *V. opulus*, or the Guelder Rose (q. v.), and *V. lantana*, or wayfaring-tree. The latter is common in hedges and copses in S. England; and its hard white wood is useful in turnery. The leaves and berries are astringent and the bark acrid. In India the fruit of several species of V. is eaten, that of *V. cotinifolium* and *V. fœtens* being sweetish, and that of *V. stellulatum* of an acid flavour. In N. America the name cranberry-tree is given to *V. oxycoccus*—its fruit having an acid taste resembling that of cranberries, but the fruit of *V. edule*—also N. American—when fully ripe is preferable. *V. tinus* is the well-known Laurustinus (q. v.).

Vic'ar. See Parson.

Vice-Ad'miral. See Admiral.

Vice-Chan'cellor, a judge in the Chancery division of the High Court of Justice, acting as an auxiliary to the Lord Chancellor. There are three vice-chancellors in this sense, the first having been appointed in 1814, and the two others on the abolition of the equitable jurisdiction of the Court of Exchequer in 1841. They take precedence next after the Lord-Justices of the Court of Appeal. Each V.-C. holds a separate court, and his decisions are subject to appeal to the Lord Chancellor or to the Lord-Justices of Appeal. The judge of the local court of chancery of the duchy of Lancaster is also called a V.-C., the chancellor of the duchy having no judicial functions.

The V.-C. of a university is a dignitary acting for the chancellor in his absence in the granting of degrees, &c. Those of Oxford and Cambridge hold office for one year.

Vice-Cham'berlain. See Chamberlain, Lord.

Vice-Con'sul, an officer acting in a certain place as subordinate to the consul of the district. He is selected by that consul, and appointed by the Secretary of State for Foreign Affairs.

Vicen'za, an old city of N. Italy, in Venetia, at the base of the Monti Berici, on both sides of the Bacchiglione, 42 miles W. by N. of Venice by rail. Surrounded by a wall and moat, it is entered by eight gates, and contains at least one fine square, the Piazzi dei Signori, in which stands a fine, lofty campanile, and Gajassi's statue of Palladio (1859). The sinuous Bacchiglione is here crossed by seven bridges. The Palazzo della Ragione, or town-hall (begun 1549), with its grand double series of open arcades, is one of Palladio's earliest works; others by the same hand are the Palazzo Chieregati, now containing the rich Museo Civico, and restored after a fire in 1855; the large Corinthian Palazzo Prefettizio (1571), and the Teatro Olimpico, inaugurated with the Œdipus Tyrannus in 1584. The Duomo, a Gothic edifice, dates from 1467. The churches, of which there are in all twenty-five, are rich in works of art; S. Corona contains a 'Baptism of Christ' by G. Bellini, S. Stefano an altar-piece by Palma Vecchio. The sanctuary of the Madonna del Monte on Monte Berico is approached by an arcade of 168 arches, and is 715 yards long. V. is the seat of a bishop, and has a royal gymnasium and lyceum, an Episcopal gymnasium, a public library of 62,000 volumes, a Pinacoteca with works of Van Eyck, Titian, the Bellinis, &c., and various learned and benevolent institutions. There are some silk and cloth industries, and a trade in cattle, grain, and fruits. Pop. (1876) 37,277. V. is the *Vicentia* or *Vicetia* of the Romans, and was destroyed by Attila in 452. In the Middle Ages it was ruled by independent princes, but later it fell successively under the Scala and the Visconti, and was eventually made subject to Venice. It was the seat of an art school best represented by Montagna, and the chief sphere of Palladio, the last great architect of the Renaissance.

Vice'roy (Fr. *vice-roi*, from Lat. *vice*, 'in place of,' and *rex*, 'king'), the title of an officer representing the regal authority in a dependency, as the Lord-Lieutenant of Ireland, and (since 1858) the Governor-General of India. Under the old Spanish monarchy the title was officially given to the governors of Naples, Peru, Mexico, and other dependencies.

Vich, or **Vique**, a town of Spain, province of Gerona, 24½ miles N.E. of Barcelona by rail. Its cathedral (founded 1040 and restored 18th c.) has fine Gothic cloisters. Weaving and paper-making, the manufacture of hats, combs, knives, &c., and the mining of coal, copper, amethyst, and topaz are the chief industries. Corn and wine are produced in the district. Pop. 10,700. V., or *Vic-de-Osane*, is a corruption of *Vicus Ausoniensis*, this town having been the capital of the Ausetani. It was the seat of a Visigoth bishop, and was sacked by Arabs in 713. A battle between French and Spaniards took place here, 19th February 1810.

Vi'chy, one of the most fashionable watering-places in Europe, in central France, department of Allier, beautifully situated on the river Allier, amid orchards and vineyards, 35 miles S. of Moulins by rail. Lying at the base of the volcanic mountains of Auvergne, it is celebrated for its hot alkaline springs, and has handsome hotels, elegant baths, and beautiful gardens. The Établissement Thermal (1787–1821) is perhaps the largest edifice of the kind in Europe Adjoining it are the magnificent Casino, a theatre, assembly and reading rooms, &c. The waters are used for drinking as well as bathing, and are singularly efficacious for indigestion, gout, catarrh, &c. Pop. (1872) 6028. See Grellety, *V. et ses Eaux Minerales* (V. 1877).

Vicia. See Vetch and Bean.

Vicks'burg, the capital of Warren County, Mississippi, U.S., is situated on the Mississippi River, midway between New Orleans and Memphis, with both of which it has steamboat communication. Though the first city in the State, V. has no buildings of any note, and its commercial prosperity, which is considerable, depends almost wholly on the cotton plantations in its vicinity. Of its thirteen churches, six are exclusively for blacks. V. is known in Europe chiefly from the siege it endured during the Civil War from General Grant, which began June 28, 1862, and ended in the capitulation of the garrison July 4, 1863. In the summer of 1878 an epidemic of yellow fever carried off 566 lives. Pop. (1877) 12,443.

Vi'co, Giovann'i Battist'a, an Italian philosophical writer, was born at Naples, June 23, 1669. He early displayed unusual ability. At the close of his legal studies he obtained the post of tutor in the family of the Marchese della Ronca; and for nine years, in the delightful solitude of the castle of Patella, he lived the life of a studious recluse, imbuing his mind with ancient lore, and meditating much on theological, philosophical, and political problems. In 1697 he was appointed professor of rhetoric in the university of Naples, but his salary was so small that he had to eke it out by private tuition. It was not until 1734–35 that, as historiographer to Charles III., with a salary of 100 ducats, the greatest Italian philosopher of his time attained a sufficient competency. And the change came too late; V.'s health was impaired, and his spirit broken. Afflictions had fallen heavy on him. Several of his children had been taken from him by death; a daughter was stricken with an incurable disease, and a prodigal son had finished his life in prison. To crown all, the old man lost his memory, and had to retire from public life. He died January 21, 1743. V.'s *Principii di una Scienza Nuova d' intorno alle Commune Natura delle Nazione* (Naples, 1725), entitles him to rank as the founder, or at least the anticipator, of the modern philosophy of history. His 'Visions' on Homer were prelusive of the Wolfian theory, and his treatment of Roman history contained the essential elements of Niebuhr's criticism. Among his minor works are *De Rebus gestis Ant. Caraphæ libri quatuor* (Naples, 1716), and *De universi Juris uno Principio et Fine uno* (Naples, 1720), the latter a remarkable treatise. The *Nuova Scienza* has been frequently reprinted (Milan 1816, Naples 1826, &c.), and translated into German by Weber (Leip. 1822), and into French by Michelet (Par. 1827) and the *Princess Belgiojaso* (Par. 1857). A collected edition of V.'s works was published by Ferrari (6 vols. Mil. 1834–35), and the Neapolitan publisher Morreno has since issued *Opere Complete di V. Illustrate e Tradotte da Pomodoro rivedute dal Prof. G. De Stefano* (8 vols. 1858–69). See V.'s own Autobiography (prefixed to first ed. of *Scienza Nuova*,

and often reprinted), Tommaseo, *G. B. V., ed il suo Secolo* (Rome, 1873); Werner, *Ueber G. V. als Geschichtsphilosophen*, &c. (Vien. 1877.

Vic'tor, the name of several Italian rulers. See VITTORIO.

Victo'ria Alexandri'na, Queen of Great Britain and Ireland, and Empress of India, born at Kensington Palace 24th May 1819, is the only child of Edward, Duke of Kent, George III.'s fourth son, and of the Princess Luise Victorie of Sachsen-Koburg, the widow of the Prince of Leiningen, and sister to Leopold, King of the Belgians. Her father's death in 1820 left her the heiress to the English throne, but till her thirteenth year this fact was kept from her, and in her own late words she 'cried much on learning it,' and presently remarked —'There is much splendour, but there is more responsibility.' Brought up in strict retirement, the young Princess was indebted to the Duchess of Northumberland for the supervision of her general studies (in Latin, modern languages, music, drawing, and botany), for her political training to the Whig Lord Melbourne; and at her accession, on 20th June 1837, all the court offices were filled by members of the great Whig houses. Indeed, her spirited refusal (1839) to change the ladies of the bedchamber, prolonging as it did the existence of the Melbourne ministry, was the single instance of opposition to the popular will; her wise interpretation of the duties of a constitutional sovereign being that 'she should be, if possible, the best-informed person in her dominions as to the progress of political events and the current of political opinion both at home and abroad,' and that, so far from being either passively indifferent or warped by party considerations, she, 'as the nation's permanent head, has to consider what is best for its welfare and honour, without distinction of party.' She had known two years before Prince Albert (q. v.) himself of the marriage between them projected by King Leopold and Baron Stockmar, and, writing to her uncle in 1836, at the close of her cousin's first visit to England, had begged him 'to take care of one now so dear to her.' Dear to her then, but how much dearer during those happy twenty years of wedded life (February 10, 1840–December 14, 1861), in which five daughters and four sons were born, and whose visits of or to foreign kings and emperors sink into nothingness beside the Highland days, or the German tour of 1845 to her husband's boyish haunts. 'They say,' she wrote in 1844, 'no sovereign ever was more loved than I, and this because of our happy domestic home, and the good example it presents.' Sympathy now is added to love for one who, always sympathising with her subjects' sorrows, lost in 1861 both mother and husband, and in 1878 her second daughter, the Princess Alice. Her eldest daughter, the Princess Victoria (born 1840), had married in 1858 the Crown Prince Friedrich Wilhelm of Prussia, and to the period of the Queen's bereavement belong the marriages of the Princess Alice (born 1843) to Prince Ludwig of Hessen in 1862, of the Prince of Wales (q. v.) in 1863, of the Princess Helena (born 1846) to Prince Christian of Slesvig-Holstein in 1866, of the Princess Louise (born 1848) to the Marquis of Lorne, appointed (1878) Viceroy of Canada, in 1871, of the Duke of Edinburgh (born 1844) to the only daughter of the Emperor Alexander of Russia in 1874, and of the Duke of Connaught (born 1850) to the Princess Louise-Marguerite, third daughter of Prince Friedrich Karl of Prussia, in 1879. To that same period belong the terrible illness of the Prince of Wales (1871), and Her Majesty's visits to Switzerland (1868), Germany (1876), and Italy (1879). The first ten years of her widowhood were passed in close retirement, and though in 1871 the Queen was present at the opening of Parliament, her speech was read by the Chancellor; but grief has never for a moment interfered with her necessary duties as sovereign or with her interest in the nation's welfare. For her husband she has reared the stately Frogmore Mausoleum, and to her people has given those singular monuments of her joys and sorrow—*The Early Life of the Prince Consort* (1867), *Leaves from the Journal of our Life in the Highlands* (1869), and *The Life of the Prince Consort* (vols. i.–iv. 1875–79), the first compiled under Her Majesty's direction by the late General Grey, the last by Theodore Martin. The history of her reign down to 1876 has been sketched already under GREAT BRITAIN, and in the articles on the different premiers; and its subsequent chief events, the annexation of Cyprus in accordance with the Anglo-Turkish Convention, the War in Afghanistan, and the Zulu War, are respectively treated of under TURKEY, YAKOOB KHAN, and ZULUS. See also Nassau Molesworth's *History of England from the Year 1830* (3 vols. Lond. 1871–73), and Justin M'Carthy's *History of our own Times, from the Accession of Queen V. to the Berlin Congress* (vols. i.–ii. Lond. 1879).

Victo'ria, the smallest but most populous and most important of the five colonies into which the Australian continent is divided. It is included between 34°–39° S. lat., and 141°–150° E. long., and would much more accurately have been termed S. Australia than the colony which misleadingly bears that name. The extreme length of V. from E. to W. is 480 miles, and its extreme breadth from N. to S. about 250 miles. Its area is 88,198 sq. miles, which is a 34th part of the total area of Australia, and 1456 sq. miles less than the combined area of England, Wales, and Scotland, without their dependent islands. The coast line of V. is about 600 miles long, and is broken chiefly by the inlets of Port Phillip (q. v.) and Western Port, and the headlands of Cape Otway (q. v.) and Wilson's Promontory.

The greater portion of V. consists of open timbered country, on which the trees grow as in a park. In the N.W. and N. are extensive plains, usually devoid of trees, but in parts traversed by belts of scrub. They are devoted to sheep-runs, some of which are as large as an English county. In the W. there is a large area of country covered with mallee scrub (*Eucalyptus oleosa*), and in the S. and E. there are forests of magnificent trees. The colony is traversed throughout its length by a range of mountains forming part of the great Australian Cordillera (see AUSTRALIA), and bearing different names in different parts. This chain, which forms the watershed of the colony, is both widest and loftiest in the E. of V., where its leading ranges are known as the Bogong Mountains (q. v.) and Australian Alps. The former contain the highest peaks in the colony, culminating in Mount Bogong (6588 feet). There are also in V. four other mountains whose height exceeds 6000 feet, eleven between 5000 and 6000 feet, and 15 others more than 4000 feet high. Nevertheless the river system of V. is insignificant, the Murray (q. v.), which forms its northern boundary for 670 miles, being fed chiefly by rivers flowing through New South Wales. The largest river whose course is wholly in V. is the Goulburn (230 miles long), a tributary of the Murray. The Goulburn and the Yarra Yarra (length 90 miles), on which the city of Melbourne stands, are the only Victorian rivers navigable by craft larger than boats. The other principal streams are the Glenelg, Avoca, Loddon, Ovens, and Snowy. In dry seasons most of the Victorian rivers are reduced either to rivulets or to mere chains of ponds. Lakes, both salt and fresh, are numerous, but many of them are little more than swamps in times of drought. Some of them occupy the craters of extinct volcanoes. The largest lake in the colony is Lake Corangamite, which has an area of 76 sq. miles, has no outlet, and is salt.

The climate of V. is extremely salubrious, and more temperate than that of any other continental colony of Australia. At Melbourne, which fairly represents the average climate of the colony, the mean annual temperature is 57·6 deg., approximating to that of Marseilles or Nice. In the smallness of the yearly range of the thermometer, however, the climate of Melbourne more closely resembles that of Lisbon. Hoar-frost and ice occur sometimes in July, and less often in June and August. Thunderstorms are frequent and severe, but the hot winds, which blow from the interior for about fourteen days every summer, are the most trying feature of the climate. They blow with great violence, bringing with them dense clouds of dust, and during their continuance grass is withered up, fruit falls from the trees, and animals suffer greatly. The wind usually changes to the S. with great suddenness, and the temperature then falls from 20° to 30° in half an hour. At Melbourne, during the thirty-five years 1840–74 inclusive, the mean annual rainfall was 27·58 inches, and the mean annual number of days on which rain fell was 135.

The indigenous fauna of V. is the same as that of extra-tropical Australia generally, including kangaroos of different species, the wombat, Ornithorhyncus (q. v.), emu, and other characteristic Australian mammals and birds, as well as snakes, lizards, &c. On the whole, however, V. is less rich in animal life than New South Wales. Sheep, cattle, and horses thrive to perfection, and their numbers are now immense, while rabbits have multiplied so as to become a serious pest in some districts. Hares, deer of several kinds, Angora goats, pheasants, Cali-

fornian quail, and other birds, have been successfully acclimatised, and some of the streams have been stocked with brown trout, perch, and carp from England. Attempts have also been made to introduce the salmon, but hitherto without success.

The flora of V. includes many species of Eucalyptus (q. v.), some of which yield timber unsurpassed in size or quality by any in the world; and among the other characteristic trees of the colony are many kinds of wattle (*Acacia*, sp.), Banksia (q. v.), Casuarina (q. v.), and arborescent ferns. The climate favours the growth of all the fruit-trees of Central and Southern Europe, such as the vine, orange, lemon, fig, olive, and mulberry, but the first alone is as yet extensively cultivated. Tobacco of good quality is produced, and its culture is extending. The warmer localities are suited to the growth of cotton, but V. will never be able to compete with Queensland and the South Sea Islands in regard to this crop. When labour is cheaper, it is probable that attention will be given to the cultivation of tea, much of the colony being well suited to that plant. Wheat of fine quality is extensively grown, as well as oats and potatoes in the southern and upland districts. In 1877 the total area under tillage in V. was 1,231,105 acres, of which 401,417 acres were in wheat, 115,209 acres in oats, 333,751 acres in artificial grasses, and 40,450 acres in potatoes.

The mineral wealth of V. is very great, and to it the colony owes its marvellously rapid prosperity. Gold was discovered at Clunes in March 1850 by the Hon. W. Campbell, but he kept the matter secret for more than a year. On 5th July 1851 gold discoveries at Anderson's Creek in the Yarra Ranges, and in the portion of the Great Dividing Range known as the Pyrenees, were made public; and as further and richer discoveries speedily followed, a 'rush' set in from all parts of the world. Tens of thousands of men flocked to V. as fast as ships could be obtained to carry them, and towns and villages sprang into existence with amazing rapidity. In 1852 gold was obtained to the value of £8,875,128, and in 1856 the yield reached its maximum, viz., £11,943,964. Up to the end of 1878 the total value of the gold obtained in V. was £192,156,524. For a number of years past the amount of gold obtained from alluvial diggings has been steadily decreasing, and 'digging' in the original sense of the term has been giving place to the extraction of gold from quartz veins. Some of the mines from which the auriferous quartz is taken are of great size and depth, the greatest depth at which gold had been obtained up to September 1878 being 1988 feet. In 1877 the total value of the goldmining plant in use in the colony was £2,000,000; and in 1878 the total yield of gold in that year, from alluvial and quartz workings combined, was 755,754 oz., valued at £3,023,016, and obtained by about 36,600 miners. As compared with 1877, these figures show a decrease of 37,085 oz. of gold, valued at £148,340, and of 1400 miners, nearly all of whom had been employed in alluvial workings. For particulars regarding some of the principal nuggets found in Victoria, and which rank among the largest obtained anywhere, see the article NUGGET. V. contains other metals, &c., besides gold, though these resources are as yet but little developed. Tin is found in considerable quantity in the Beechworth (q. v.) district; iron is plentiful in many places, and is beginning to be wrought at Ballarat; copper is found in Gippsland; and lead, antimony, and manganese are also obtained in the colony. Unfortunately, coal is both scarce and poor, and for this important article V. is dependent on New South Wales, though it is reported that good coal exists in Gippsland in a district difficult of access. The colony is rich in building-stones and marble, and valuable slate-flagging is obtained near Castlemaine. Diamonds of small size, but fine quality, have been found, as well as good specimens of the ruby, sapphire, topaz (white, blue, and pink), beryl, garnet, and onyx.

The commerce of V. is very extensive, and is carried on chiefly with the neighbouring colonies, the United Kingdom, United States, and China. In 1877 the total value of the imports was £16,362,304, and of the exports £15,157,687. Of the latter, wool was much the most important item, after it coming gold, tallow, hides, skins, and preserved meats. A considerable proportion of the gold obtained in the colony is coined at the Melbourne mint. On June 30, 1878, there were 967 miles of railway open for traffic, the traffic receipts for the preceding twelve months amounting to £1,199,058; and in 1877 there were 2885 miles of telegraph in operation. The rateable property in municipalities at the same date was valued at £77,000,000; and the public revenue of the colony for the financial year 1877-78 was £4,723,877. The public debt on 30th June 1878 was £17,022,065, or £19, 12s. 4d. per head of the pop., which was officially estimated to be 867,634 on the same date. At the last census, taken in 1871, the pop. was 731,528, of whom 17,935 were Chinese, and 1330 aborigines; and on December 31, 1877, it was estimated to have risen to 800,803. The colony is divided into 37 counties, and its capital, Melbourne, is the most important city in the southern hemisphere. The other principal towns are Ballarat, Sandhurst, Castlemaine, Geelong, Williamstown, Daylesford, and Warrnambool, particulars regarding which will be found under their respective headings. An International Exhibition is to be opened 1st October 1880, and the building, which is to cost £95,000, is (1879) in process of construction.

V. was first seen by Lieutenant Hicks, an officer of Cook's expedition, who sighted the coast of Gippsland on 19th April 1770. In 1803 the first attempt at a settlement was made near the entrance to Port Phillip by a Government expedition from Sydney, headed by Colonel Collins, but it was speedily abandoned. In 1824 the explorers Hamilton Hume and W. H. Hovell reached Port Phillip overland from Sydney, discovering the river Murray on their way. In 1825 another abortive attempt at settlement was made, this time on the shores of Western Port. On 19th November 1834 the Messrs. Henty, merchants in Tasmania, founded the first permanent settlement in V. at Portland Bay. On 28th August 1835, an expedition organised by John Pascoe Fawkner, an innkeeper at Launceston, Tasmania, founded a settlement which afterwards became the city of Melbourne. In 1836 the interior of V. was explored by Sir Thomas Mitchell, whose glowing report led to a rapid influx of population from New South Wales, Tasmania, and the United Kingdom. The regular government of the settlement commenced with the arrival of the first resident magistrate, Captain Lonsdale, on 29th September 1836, and on 1st July 1851 the district of Port Phillip was separated from New South Wales and formed into the colony of V., its pop. being then about 80,000. Almost at the same time the gold discoveries began, as detailed above. On 23d November 1855, the constitution of the colony, under which it received the privilege of responsible government, was proclaimed, and is still in force, with certain modifications. The government is now administered by a governor appointed by the Crown and holding office for seven years, assisted by an executive council of ten members, who are responsible to a legislative council composed of 30 members, representing 6 electoral provinces, and a Legislative Assembly composed of 78 members, representing 49 electoral districts. See *The Colony of V.*, by W. Westgarth (Lond. 1864); *The Gold Fields and Mineral Districts of V.*, by R. Brough Smyth (Melbourne and Lond. 1869); *Official Record of V. for the Philadelphia Exhibition* (Melbourne 1875); *The Victorian Year Book*, by H. H. Hayter (Melbourne and Lond. 1878); Sabillière, *Early History of the Colony of V.* (2 vols. Lond. 1878); and R. B. Smith, *The Aborigines of V.* (Melb. and Lond. 1878).

Victo'ria, the capital of British Columbia, beautifully situated on the Strait of Fuca, at the S.E. extremity of Vancouver's Island. It is a free port with considerable trade, and in regular steamship communication with New Westminster, Olympia, and San Francisco, but owing to the shallowness of the harbour large vessels have to unload at Esquimalt, 3 miles distant, where also the British naval force is stationed. Besides handsome government buildings, V. has five churches, a theatre, hospital, &c., and is rapidly increasing in importance. Founded in 1843 as a trading port of the Hudson's Bay Company, it became the capital of the new colony of Vancouver Island in 1859, and of Columbia in 1866, when the discovery of gold attracted a crowd of diggers. Pop. (1871) 4540.

Victo'ria, the capital of the Brazilian province of Espirito Santo (q. v.), is situated 270 miles N.E. of Rio de Janeiro, on an island in a bay forming a fine harbour. It is fortified, and has a considerable coasting trade. Pop. 6000.

Victo'ria is the name given in honour of Queen Victoria to the most magnificent genus of the natural order *Nymphaceæ* (q. v.). There is only one species recognised by botanists, namely, *V. regia* or *V. regina*, a native of the Amazonian region of S. America, where it appears to have been first observed by

the unfortunate botanical traveller Hænke in 1801, to have been met with by the French naturalist D'Orbigny in 1827, but not made known to European horticulturists until after its discovery in British Guiana ten years later by Sir Robert Schomburgk. This noble water-lily has floating leaves of a bright green above, and a deep purple or violet on the lower surface, measuring as much as 7½ feet in diameter, with a uniformly turned-up margin of about 3 inches, thus resembling huge shallow trays. The flowers, which are proportionately as large —some measuring 14 in. in diameter—are of all shades from white to pink, and are delightfully fragrant. The fruit is globular, and thickly beset with formidable prickles. The seeds are edible. In 1846 perfect seeds in a condition fit for germination were received at Kew, but the plants died whilst young. In November 1849 the V. flowered for the first time away from its native streams and lakes at Chatsworth, under the care of Sir Joseph Paxton. It has since been introduced successfully in the E. and W. Indies and other tropical countries.

Victo'ria and Albert, Order of. See CROSS, VICTORIA.

Victo'ria Lake, more commonly called **Lake Alexandrina**, a shallow, brackish lagoon on the coast of S. Australia, measuring 30 miles by 27, through which the river Murray (q. v.) discharges into the sea. It has a narrow entrance, with a dangerous sandbar, which only small vessels can cross.

Victo'ria Nyan'za, the largest known lake in Africa, was discovered by Speke on 30th July 1858, and first circumnavigated by Stanley in eighty days in 1875. Its centre is at the intersection of the parallel of 1° S. lat. with the meridian of 33° E. long. The lake is roughly rhomboidal in shape, and has an area of about 26,500 sq. miles, or six-sevenths of that of Scotland, and is about 3800 feet above the sea-level. On the S., S.E., and N.E. its coast-line is indented by large gulfs, and its shores are fringed by many islands, the largest of these being Ukerewe in the S.E. and Sasse in the N.W., each of which is about 40 miles long. The shores of the lake are hilly and ridgy on the N. and W., rugged and mountainous on the S. and S.E., thence proceeding northwards they are first low and marshy, and then bold and precipitous. Of the many streams which empty into the lake the chief are the Shimiyu in the S.E., which is a mile wide at its mouth, and is probably the longest source stream of the Nile, and the Kagera, Kitangulé, or Alexandra Nile, which disembogues on the W. The lake discharges at its N. extremity by the Victoria Nile, which issues from it at the Ripon Falls, 12 feet high, discovered by Speke and Grant in July 1862.

Victor-Perrin, Claude, Duke of Belluno and Marshal of France, was born at La Marche in the Vosges, December 7, 1764, and having served as drummer (1782-89), rose, thanks to the Revolution and his own bravery in the siege of Toulon (1793), to be brigadier-general of the East-Pyrenean Army. He saw two Italian campaigns, commanded in La Vendée, and on the revolution of 18th Brumaire attached himself to the First Consul, following him once more to Italy, where at Marengo (1800) his eight hours' stubborn resistance turned the impending defeat into a victory. Ambassador to Denmark (1805), he was taken prisoner in the Prussian campaign, but exchanged for Blücher in time to earn at the battle of Friedland a marshal's baton (1807); and having held the governorship of Berlin, was despatched to the command of the 1st corps d'armée in Spain (1808), where his success at Espinosa and Medellin hardly made up for the defeats of Talavera and Barossa. In the retreat from Moscow he signalised himself by covering the passage of the Berezina (1812), at Dresden cut off the Austrian left wing (1813), and in 1814 fought with his wonted gallantry till a wound received at the battle of Craonne ended his military career. To Napoleon V. owed his advancement, but on Napoleon's fall he became a royalist, accepting a pension from Louis XVIII., and even presiding at his old colleague's trial. In 1821 he was minister of war, and two years later was appointed ambassador to the court of Vienna, which refused, however, to recognise his ducal title conferred by Napoleon; thenceforward he lived in strict retirement, dying at Paris, March 1, 1841.

Vi'docq, Eugene François, a French adventurer, was born at Arras, July 23, 1775. After a dissolute and wandering life, in which he had been sharper, soldier, forger, and convict, he served from 1808 till 1827 as a detective in the Paris police, and assisted materially in ridding the city of the dangerous classes whose ranks had been so remarkably recruited during the revolutionary period. On his discharge from the force he established a paper-mill at St. Maudé, near Paris, and in 1836 he opened a private office for the recovery of stolen property, which was very naturally closed by the police, whose monopoly it infringed. He afterwards lived for some time in Belgium and England, and it is said that his services were employed by the republican government of 1848. He died at Paris, May 1857. It is doubtful whether he was really the author of the *Mémoires de V.*, published under his name (Par. 1828, new ed. 1868; Eng. trans. Lond. 1847), and at any rate they cannot be accepted as trustworthy. The other works professedly from his pen are still more certainly pseudonymous.

Vielle', the old name for the hurdy-gurdy. It had usually five strings, and was tuned in various ways. It was a favourite and even fashionable instrument in France in the middle of the 18th c. It is still played by itinerant Savoyards in the streets of London and Paris.

Vienn'a (Ger. *Wien*, Lat. *Vindobōna*), the Austrian Kaiserstadt, lies in a plain at the foot of the Wiener Wald, in an angle formed by a southern branch (miscalled 'canal') of the Danube and its tiny tributary, the Wien. The Danube itself skirts the fast-spreading N.E. suburb, following for 8¾ miles the artificial channel whose construction (1869-75) has saved V. from the fate of Szegedin. 'Lines,' or external fortifications, 12 feet high, and pierced by fourteen gates, still part the suburbs from the ten wards of V. proper, but will soon be levelled, as in 1858 were the ramparts encircling the Innere Stadt. These with their *glacis* have now given place to noble boulevards, which, formed by nine 'Rings' and the Franz Joseph Quai, are 3 miles long and from 50 to 70 yards wide, are traversed by tramways, and with their avenues, gardens, and sumptuous modern architecture present the strongest contrast to the tortuous streets and narrow *places* of the ancient Stadt. In the heart of the latter rises the cruciform Stephansdom (1144; mainly rebuilt 1300-1562), with long-drawn choir and triple nave (together measuring 354 feet), traceried windows of richest glass, fretted roof upborne by eighteen sculptured pillars, the 12th c. Romanesque façade flanked by octagonal towers, and the airy, open-work spire, 453 feet high (rebuilt 1860-64). Close by, the gloomy palace of the Burg, now for five centuries the Hapsburgs' residence, presents its 'simple amalgamation of diverse constructions with no especial styles'—the splendid Rittersaal (1804), the Augustine church (1330-1783), with Canova's marble monument to the Archduchess Christine, the Imperial Library of 20,000 MSS. and 300,000 volumes (12,000 incunabula), the Treasury, and sundry rich art and science collections. Other buildings of the Stadt are the Capuchin church (1632), containing the imperial vault, the church of Maria Stiegen, with an heptagonal tower 187 feet high, the new Synagogue (1853-58), the church of the Non-United Greeks (1804-58), adorned with frescoes by Rahl and Thiersch, the old Rathhaus (13th c.-1842), the former University buildings (1755; since 1857 occupied by the Academy of Sciences), the disused Exchange in Renaissance style (1856-60), the palaces of the archbishop (1640) and numberless princes and nobles, the massive convents, hospitals, and six-storied *höfe*, with grand arched gateways and overhanging roofs, all huddled together, all speaking of the past. In all, V. has 3 Protestant, 4 Greek, and 56 Catholic churches, and of the last 36 stand beyond the Rings, among them the baroque Karlskirche (1716-37), with a lofty dome and two minaret-like columns; the Altlerchenfeldkirche (1848-61), richly adorned with frescoes; the Gothic Elizabethkirche (1866); and, finest of all, the Votivkirche (1856-79), which, built in the purest 13th c. Gothic at a cost of £375,000, vies for its endless adornment and western spires (325 feet high) with the Stephansdom itself, certainly with any ecclesiastical structure of the present century. On either hand of the Votivkirche may be seen all seven lamps of architecture blazing together in sumptuous piles, the mushroom growth of a brief speculative mania that gave V. 2069 new buildings during 1870-76. Here stand the palaces of *nouveaux riches*, whose riches have taken wings; there vast hotels, run up to receive the guests that never came in 1873, and since disposed of for anything they would fetch, one of the largest to become the Central Police Office. Within six years the members of the Stock Exchange increased from 1000 to 3200, so a new Bourse was built in Renaissance style at a cost of £500,000 (1869-76): M. Tissot counts up the suicides

already committed in its corridors. Mania and panic both are over, and all that V. now can do is admire and complete her work. A five-storied Gothic Rathhaus (1872-82), with a tower 351 feet high, covers 205,535 sq. feet, and will cost £850,000; to its right have been rising since 1874 University Buildings in Renaissance style, at a cost of £800,000 more; to its left, classic Houses of Parliament; and in front the new Court Theatre, an Italian Renaissance structure, seating 2000 persons, is to be finished by 1881, after an outlay of £500,000. Also upon or near the Rings, and all in the Renaissance style, are the Art and Natural History Museums (building since 1871), the Künstlerhaus (1865-68), the Academy of the Plastic Arts (1872-77), and the Art and Industrial Museum (1868-71), adorned with sgraffito friezes and thirty-six medallion portraits. Vienna's choicest art-treasures are stored in the Belvedere (1715-24), close to the Lines, and once the residence of Prince Eugen. Its galleries, fortunate in a fair representation of every school, are specially rich in Flemish, Venetian, and Lombard master-works. Holbein's 'Jane Seymour' and 'Dr. Chamber,' Van Dyck's half-length 'Charles I.,' Velasquez' priceless 'Family Picture,' Titian's 'Karl V.,' and Rubens' 'Maximilian I.;' these, with other hardly less famous paintings, are splendidly reproduced in *Die K. K. Gemälde Galerie in Wien: Radirungen von W. Unger, Text von C. v. Lützow* (Part VI. Vien. 1878). In the Lower Belvedere are collections of antiquities, armour, and curiosities; and fine private picture-galleries are contained in the Lichtenstein, Schonborn, Czernin, and Harrach Palaces. Of ten theatres, besides the already-mentioned Hofschauspielhaus, the chief are the French Renaissance Opera-House (1861-68), which, holding 3000 spectators, atones for a somewhat undignified façade by its magnificent internal fittings; the Theater an der Wien (1845), the Karlstheater (1847), the Wiener Stadtheater (1872), and the Komische Oper (1874). Music has also its Musikvereins-gebaüde (1867-70), with a library of 20,000 musical works; science is represented by a magnificent chemical laboratory (1871), the meteorological institute (1872), and the buildings of the Horticultural Society; and to education are devoted the hitherto scattered buildings of the University (q. v.), a Polytechnic (1815) attended by 1509 students in 1876, seven gymnasia, ten *real-schulen*, and 176 elementary schools. The cost to the Commune of education was £257,142 in 1877, while close on £400,000 was spent on school buildings during the six preceding years. V. possesses more than 100 bridges (31 within the Lines), but two only are older than 1824. Worthy of special notice are the five constructed (1870-76) across the new channel of the Danube; the 14th c. Stubenbrücke, Tegetthoffbrücke (1872), and Elizabethbrücke (1854), adorned with eight marble statues, across the Wien; and across the Danube Canal the suspension Aspernbrucke (1864). This leads to the Prater, a Rotten Row and Greenwich Park combined, with its stretches of shady turf, its quadruple chestnut avenue, its streets of booths, and towering aloft the vast Rotunda, 344 feet in diameter, of the Weltausstellung of 1873, which was visited by 7,254,687 persons, but showed a heavy deficit in its receipts. In the Prater may be seen Vienna's favourite outdoor life, or in the Volksgarten (where Strauss's band plays daily), the Hofgarten, Stadtpark, and other pleasant gardens of the town itself, which like the *places* are adorned with numerous monuments and fountains—the Mariensäule (1667), Votivdenkmal (1732), equestrian statues of the Archduke Karl (1860), Prince Eugen (1865), and Fürst Schwarzenberg (1867), memorials to Schubert (1872), Schiller (1876), Zelinka (1877), &c. Of barracks, more numerous than well arranged, the chief is the Rudolfskaserne (1865-69); but V.'s great military establishment is the Arsenal (1849-55), standing beyond the Lines, near the Belvedere. Its spacious quadrangle, 520 by 440 yards, contains a hospital, church, barracks, and a fine museum of weapons, besides iron-works, a cannon-foundry, &c. New waterworks, the largest in the world, were constructed in 1870-74 at a cost of £2,400,000, and by means of tunnels and aqueducts bring water from the Alps, 54 miles distant. To enumerate the industries of V. were an impossible task, their value amounting in 1870 to £33,600,000; but among specialties are its manufactures of meerschaum, leather knick-knacks, carved furniture, jewellery, and terra-cotta, besides the brewing of its famous beer. Its situation also on a great water-highway, and as the centre of ten lines of railway, makes it a place of enormous traffic, in cereals, wine (231,000 hectol. 1876), minerals, stock (933,460 head), leather, wool, silk, and such like wares. From 175,460 in 1754, the population had grown in 1875 to 673,865, or with the suburbs 1,020,770; and of the 607,514 inhabitants in 1869, 545,506 were Catholics, 40,230 Jews, and 16,767 Lutherans. Only 270,911 were natives, the rest being Magyars, Czechs, Tyrolese, Poles, Greeks, Armenians, &c., whose Babel of tongues and national costumes distinguish V. from the great Western capitals.—Under the shadow of the Stephansdom stands the 'Stock im Eisen,' a pine-tree stump, clasped by an iron ring, and pierced with the nails of hundreds of journeymen locksmiths. Round the holy grove, of which it is last survivor, a Celtic settlement sprang up before the Romans in the 1st c. A.D. founded *Vindebona*, where Marcus Aurelius died (150), and which was a flourishing municipal town down to its destruction by Attila in the 5th c. Restored in the 12th by Heinrich Jasimirgott, who here fixed his residence as Duke of Austria and founded both Dom and Burg, V. increased so fast, thanks to its situation on the Crusaders' route, that under Ottokar of Bohemia (1251-86) the Stadt attained its present dimensions. From him it was wrested by Rudolf of Hapsburg (q. v.), and since has shared the fortunes of that dynasty. Besieged by the Turks under Suleiman II. (1529), and under Kara Mustapha (1683), it was saved on the first occasion by the valiant defence of Nikolaus von Salm, on the second by the appearance of John Sobieski; but in 1809 it had to capitulate after bombardment to the French. Its famous Congress (1814-15) resulted in the fifth Treaty of V., by which Austria recovered her cessions of 1809, Great Britain Hannover, and Switzerland her ancient constitution; the Pope was reinstated, Germany and Italy were re-distributed, Poland was united to Russia, Belgium to Holland, and Norway to Sweden. The October Revolution of 1848 placed the city for a time in the hands of the insurgents; in 1866 might be seen from its towers the watchfires of the Prussian victors of Sadowa. See Waagen, *Die Vornehmsten Kunstdenkmäler in Wien* (2 vols. Vien. 1866-67); Perger, *Der Dom zu St. Stephan* (Triest 1854); Weiss, *Geschichte der Stadt Wien* (Vien. 1872), *Topographie der Stadt Wien* (Vien. 1876), and *Führer durch Wien* (Vien. 1878); H. Reeve, *Journal of a Residence at V. in the Eventful Winter* 1805-6 (Lond. 1877); Tissot, *Vienne et la Vie Viennoise* (Par. 1878), and Felder, *Die Verwaltung der Stadt Wien in den Jahren* 1874-76 (Vien. 1878); Seis, *Wien und Umgebung* (4th ed. Vien. 1878); and the Earl of Westmoreland, *Great European Congresses of V.* (Lond. 1859).

Vienne, a department in the W. of France, comprises the E. part of the old province of Poitou. It is bounded W. by Deux Sevres, N. by Indre et Loire, E. by Indre and Haute V., and S. by Charente. Area, 2690 sq. miles; pop. (1876) 330,916. Its surface is mostly level, with some small hills in the S.; the centre is a rich plateau intersected by small valleys on the E. The chief river is the V., a tributary of the Loire, flowing N. through the department. The department contains mineral springs, iron mines, and quarries of lithographic stones, but the chief sources of revenue are wheat, oats, and wine, of which in 1876 there were produced respectively 4,600,750 bushels, 3,286,250 bushels, and 10,098,000 gallons. The capital is Poitiers (q. v.).

Vienne, a town of France, department of Isère, on the left bank of the Rhone, and a station on the Lyon-Marseille railway, about 19 miles S. of the former city. Besides the cathedral of St. Maurice (reckoned the finest specimen of Gothic architecture in France), and the newly-restored church of St. Pierre, V. contains a library, theatre, communal college, and museum of antiquities. The chief manufactures are of cloth and other woollen stuffs, in which 4000 workmen were employed in 1877, but paper, leather, silk, glass, machinery, and hardware goods are also made. Pop. (1876) of the commune, 26,502. From the time of the Romans, of whom the obelisk known as L'Aiguille, and the remains of a portico and amphitheatre are still extant memorials, V. has been a place of considerable importance. During the Middle Ages it was a Burgundian capital, and more than one Church council was held here, the most important being that of 1312, in which Clement V. pronounced the suppression of the Knights Templars.

Vienne, Haute-, a department of France S.E. of the department of V., is mostly hilly, and though rich in metals and various kinds of clay, is not well suited for agriculture. Chestnuts and vines, however, are cultivated to a considerable extent, and the upper meadows are grazed by a valuable breed

of horses. It is watered by the Upper V. and the Gartempe. The chief manufacture is porcelain, but there are also several spinning-mills, tanneries, paperworks, &c. Area, 2129 sq. miles; pop. (1876) 336,061. The chief town is Limoges (q. v.).

Vier'sen, a town of Rhenish Prussia, on the Nord-Canal, 5½ miles N.E. of Gladbach by rail. It has one Evangelical and one Catholic church, carries on dyeing and bleaching, and manufactures silks, half-silks, cottons, woollens, velvet, ribbons, lace, damask, leather, strawplait, and tobacco. Flax is extensively cultivated in the neighbourhood. Pop. (1840) 4543; (1875) 19,705.

Vierzon-ville, a town of France, department of Cher, at the confluence of the Yèvre and the Cher, 50¾ miles S. of Orleans by rail. It has some important ruins. There are manufactures of porcelain, glass, parchment, leather, hosiery, and vinegar. Corn and vines are grown in abundance. Pop. (1876) 8995.—**V.-Village**, less than a mile distant, has manufactures of lace and wire-drawing. Its once famous steel-works and blast-furnaces are no longer in operation. Pop. (1876) 1058.

Vie'ta, Franciscus, or **François Viette**, the greatest French mathematician of the 16th c., was born at Fontenai-le-Comte, near La Rochelle in 1540. He seems to have been entirely self-taught as a mathematician; but, excepting a few anecdotes related by De Thou, we know little of his life. He was *maître des requestes* at Paris under Henri III. and Henri IV., and did valuable service to his government in the decipherment of the secret communications of the Spanish court. The reformed Gregorian calendar of 1582 was attacked by V., who published what he deemed a more correct one in 1600, supplementing this publication by a vehement expostulation two years later. His death at Paris in 1603 probably prevented any action being taken against him similar to what Galileo experienced some years later. V. was the first to employ letters in algebra to signify quantities, and first systematically combined these with symbols of operation, thus greatly facilitating the application of algebraic methods to the working of problems. Besides thus being the founder of modern algebra, he greatly developed the theory of equations, and by means of his improved methods widely extended trigonometry, discovering the relations of multiple angles, and completing the solution of right-angled spherical triangles. He also gave an expression for the approximate quadrature of the circle. His works were collected and published by Schooten in 1646; but this edition does not contain the *Harmonicon Celeste*, of which two MSS. exist in Florence and Paris, and the *Canon Mathematicus* (1579), which contains the first complete table of the circular functions.

Vigan, Le, a town of France, department of Gard, 45 miles W. by N. of Nîmes. It has a corn-exchange built on the site of a Roman temple, and an avenue of splendid chestnuts. Near it are the mineral waters of Cauvalat. V. has manufactures of leather, silk, cotton, and wine, and horses are largely bred in the district. Pop. (1872) 4340.

Vige'vano, a town of Italy, province of Pavia, on the Ticino, 15 miles N.W. of Novara by rail. It has a large market-place surrounded by arcades, a fine cathedral, and the castle of Sforza (now a cavalry barrack). V. manufactures silk, macaroni, cotton, soap, and hats, and exports macaroni and silkworms. Pop. (1874) 14,096.

Vi'gil (Lat. *vigilia*, from *vigilare*, 'to watch') is the evening or night before a day sacred to some saint, which in the ancient church was spent, like those before the Lord's day and other great festivals, in praise and prayer till the morning light, generally in church, especially in churches dedicated to the saint whose festival was being commemorated. The popular English name is *Eve*—as Christmas Eve, Hallowe'en—and *Wake*, which is a literal translation of V. The observance of V. is still kept up in the Roman Catholic, and to some extent in the Anglican, Church.

Vignette' (Fr. *vigne*, 'a vine'), an engraving, not enclosed within a definite border, used for the embellishment or illustration of a book. The capital letters with tendril ornaments of ancient MSS., and, later, the head- and tail-pieces of printed books, were termed vignettes. The term is also applied to a running ornament of leaves and tendrils used in Gothic architecture.

Vigny, Alfred Victor, Comte de, a celebrated French poet, was born at Loches, Indre-et-Loire, 27th March 1797, of a noble family, which, strange to say, did not emigrate at the Revolution. He was educated at Paris, and admitted at the Restoration into the King's bodyguard of 'Gensdarmes de la Maison Rouge.' On the dissolution of this corps after the Hundred Days he entered the Royal Guard. While on frontier service at Pau during the Spanish War, in which, however, he did not take part, he met a young and wealthy English lady, Miss Lydia Bunbury, whom he married, and shortly after left the army (1827). As early as 1822 he had published his first collection of *Poèmes*, which was followed in 1824 by the graceful and touching allegory of *Eloa, ou la Sœur des Anges*. He was now recognised as one of the chief of the new Romantic school of poets, and gradually came more and more under the influence—for him by no means a beneficent one—of Victor Hugo, the leader of the school, whose influence was marked in the *Poèmes Antiques et Modernes* (Par. 1826; 2d series 1837), and became still more prominent in *Stello* (Par. 1832), in which V. related the tragic stories of the three poets, Gilbert, André Chénier, and Chatterton. His famous and highly successful, though now little read, historical romance, *Cinq-Mars, ou une Conjuration sous Louis XIII.*, had appeared in 1826, and from it Lord Lytton probably gained some ideas for his drama of *Richelieu*. It was in his drama of *Chatterton*, however, produced at the Théâtre Français, 12th February 1835, that V. achieved his crowning success, his previous dramatic attempts, in the shape of adaptations of *Othello* and the *Merchant of Venice*, and a historical drama, *La Maréchale d'Ancre*, having been little better than failures. In the same year he published his *Servitude et Grandeur Militaire*, the matter of which was drawn from his military experiences, and after this he lived in retirement and wrote little. In 1841 he addressed to the Chamber of Deputies a *Mémoire sur la Propriété Litteraire*, recommending that the heirs of an author should have an interest in every edition of his works. In 1845 he succeeded to the fauteuil of Etienne in the Academy, but was coldly received on his inauguration. He died at Paris, 17th September 1863, leaving a collection of poems published under the title of *Destinées* (Par. 1864), besides the *Journal d'un Poète* (1867), and the romances *La Veillée de Vincennes* (1867) and *Laurette ou le Cachet Rouge* (1867). See Mirecourt's *A. de V.* (Par. 1855), Porry's *A. de V., Étude Morale Litteraire* (Marseilles 1864), A. France's *A. de V.* (Par. 1868), Magnin's *Causeries Litteraires*, and Sainte-Beuve's *Portraits Contemporains*.

Vi'go ('Bay town'), a fortified seaport of Spain, province of Galicia, rising like an amphitheatre from the S. shore of the Ria de V., which runs up from the Atlantic Ocean for 20 miles between steep hills, 23 miles N.N.W. of Tuy by rail. It is surrounded by walls, and defended by two strong forts on the hill commanding the town. Its safe and commodious harbour is sheltered by an island within the bay. V. has productive sardine and tunny fisheries. In 1873 its imports amounted to £873,280; its exports (chiefly live stock, maize, hams, and sardines) to £381,640. It is a station for the English steam-packets between London, Southampton, and Oporto, Lisbon, Cadiz, and Gibraltar. Pop. 6800. In V. Bay the English and Dutch fleets under Rooke annihilated the Spanish 'Plate Fleet,' 23d October 1702.

Vik'ings (Old Norse *Vikingr*, 'creekers,' from their anchoring in *viks* or 'bays'), the Scandinavian pirates who from the beginning of the 9th c. ravaged the coasts of western Europe. See NORTHMEN, and the works there mentioned; also Dr. G. Storm, *Kritiske Bidrag til Vikingetidens Historie* (Christiania 1879).

Vik'ramadit'ya, a great legendary Hindu monarch of India, whose capital was at Oojein (q. v.) in Malwa, and whose era, 57 B.C., is still current in Hindustan proper. He is regarded as the champion of the revived Brahminic faith, who drove away the Buddhists to Ceylon.

Vilkomir', a town of Russia, government of Kovno, on the Sventa, 45 miles N.N.W. of Vilna. It has a fine old Catholic church, a synagogue, and a considerable trade in linseed. Pop. (1875) 11,118.

Villafran'ca, a town of Italy, province of Verona, on the Verona and Mantua Railway, has some considerable silk manufactures, but is chiefly celebrated as having been the main seat of the wars of 1848 and 1866. On July 11, 1859, the preliminaries for peace were signed here between the Emperor of Austria and Napoleon III. Pop. (1874) 8344.

Villafran'ca del Panades, a town of Spain, province of Barcelona, said to have been founded by Hamilcar, is the centre of some small inland trade in fruit and wine. It has a venerable Gothic palace of the Aragonese kings. Pop. 5500.

Vill'a Ri'ca, another name of Ouro Preto (q. v.), the capital of the Brazilian province of Minas Geraes.

Villa'ri, Pasqua'le, born at Naples in 1827, for participation in the Revolution of 1848 was forced to take refuge in Florence. Thence he was called (1859) to the chair of philosophy at Pisa, and thither, having meanwhile travelled in England and Germany to study their educational systems, he returned in 1866 to become professor of history in the Instituto di Studj Superiori. Among his works are *La Storia di Savonarola e de' suoi Tempi* (2 vols. 1859-61; Eng. trans. 1863); *La Civiltà Latina e Germanica* (1862); *Le Leggende che illustrano la Divina Commedia* (1865); *Macchiavelli* (1877; Eng. trans. 1878), and *Le Lettere Meridionali, ed Altri Scritti sulla Questione Sociale in Italia* (1878).

Vill'ars, Claude Louis Hector, Duc de, a French marshal, was born 8th May 1653 at Moulins. He began life as a page of the Grand Monarch, and his earlier campaigns were in the Netherlands and Hungary. In his later career the principal points are his victory at Pforzheim (1693), an embassy to Vienna (1697), the victories of Friedlingen (1702) and Hochstädt (1703), the suppression of the rebellion in the Cevennes (1704), his defeat at Malplaquet (1709), his victory at Denain (1712), and the campaign in Germany which was closed by the treaty of Rastatt. After a long period of peace, during which he became minister of state, he received the chief command in the Italian campaign of 1733. He died on the way to Turin, 17th June 1734, after the capture of Pizzighettone. V. was received a member of the French Academy in 1714. His *Mémoires* (the Hague 1734, 1758) are, with the possible exception of the first volume, the work mainly of the Abbé La Pause de Margon. See Anquetil, *Vie du Maréchal de V.* (4 vols. Par. 1784), and D'Alembert, *Hist. des Membres de l'Académie Française.*

Villar'sia, a genus of perennial water herbs belonging to the natural order *Gentianaceæ*, of wide distribution through temperate and tropical regions of the Old and New Worlds. The leaves are entire or lobed, and the flowers, which are usually yellow, are fringed with fine hairlike processes. In India *V. Indica* is used medicinally, and is a remedy for snake-bites.

Ville'franche de Rouergue, a town of France, department of Aveyron, on the river Aveyron, 76½ miles N.E. of Toulouse by rail. It stands in a mountainous district, and possesses many fine specimens of Gothic and Renaissance architecture. The Gothic church of Notre Dame, that of the Augustins, and a cloister of the Chartreuse monks, are the most interesting buildings. V. has manufactures of cloth, hats, and paper. The surrounding hills contain ores of copper, silver, and tin, and copper is extensively worked. Wine, corn, and copper utensils are exported. Pop. (1876) 7819.

Ville'franche-sur-Saône, a town of France, department of Rhône, on the Morgon, near its confluence with the Saône, 18 miles N. of Lyon by rail. It is well built, and contains an interesting Hôtel-de-Ville, and the church of Nôtre-Dame-des-Marais, dating from the 14th c. There is a library, a chamber of agriculture, and a Jesuit college. Cotton and woollen goods are manufactured, and there is a trade in horses, cattle, hides, cloth, hemp, and wines. Pop. (1876) 11,994.

Villehar'douin, Geoffroi Sire de, an old French warrior and chronicler, was born probably about 1155 or 1160, in the family château near Bar-sur-Aube. In 1180 he succeeded his father Guillaume as Marshal of Champagne under Thibaut, brother of Henri II. of France, and in 1201 he was one of the ambassadors despatched to Venice to make arrangements for the transport of the forces for the fourth crusade. On his return he found Thibaut dangerously ill, and it was soon his duty to act as guardian of the rights of the widowed princess, Blanche of Navarre. Having concluded a treaty in her name with the king, Philippe Auguste, he departed for the East, where he distinguished himself greatly in the conflict which finally placed Baldwin of Flanders on the throne of the Byzantine empire. Rewarded by the new monarch with extensive lands on the Hebrus, and appointed Marshal of Rumania, he repaid the favour by saving the crusaders from disastrous defeat near Adrianople in 1205. On his death in 1213 his nephew Geoffroi inherited his title and possessions. The narrative of the fourth crusade, by which V. ranks among the most important historians of the time, covers the period from 1198-1207, and consists largely of his own personal experience. Its principal defect is the prominence given to purely military matters. First published by Blaise de Viginère as *Histoire de la Conqueste de Constantinople, par les barons François associez aux Venetiens, l'ann 1204, d'un coste en son viel Langue et de l'autre en un plus moderne et intelligible* (Par. 1584), it has been frequently re-edited—by Ducange (1657); by Petitot in his *Collection des Mémoires*, tome i. (1819); by Bouquet in his *Rerum Gallic. Scriptores*, vol. xviii.; by Paulin Paris (Par. 1838); and by Natalis de Wailly (first edit. 1871, 2d 1874). There is an English translation by T. Smith, *Chronicles concerning the Conquest of Constantinople* (Lond. 1829), and a German translation by Todt (Halle 1878). See *Hist. Litt. de la France*, vol. xvii., and Marius Sepet, *Geoffroi de V.* (Par. 1874).

Villein. See SLAVERY.

Ville'main, Abel François, a celebrated French author, born at Paris June 11, 1790. Educated at the Lycée Louis-le-Grand, he was at the age of twenty appointed assistant-professor of rhetoric at the Lycée Charlemagne, and soon afterwards professor at the École Normale. In 1812 he gained the prize of the Academy for his *Éloge de Montaigne*, on the 21st April 1814 he read before the King of Prussia, the Czar Alexander, and the *élite* of Parisian society his essay *Avantages et Inconvénients de la Critique;* and two years after, he was crowned a third time for his *Éloge de Montesquieu* (25th August 1816). Already assistant to Guizot in the chair of modern history, V. was now appointed professor of French eloquence at the Sorbonne, and in a brilliant career of ten years carried the philosophic spirit that distinguished Cousin in philosophy and Guizot in civil history into the history of French literature. Before the publication of his lectures of 1827-30 as *Cours de la Littérature Française* (1828; new ed. 6 vols. 1864), he had won a high reputation as a critic by his *Mélanges* (1823; new ed. 1860) and *Nouveaux Mélanges* (1827), and as a historian by his *Histoire de Cromwell* (2 vols. (1819), and the dramatic study *Lascaris, ou les Grecs du XV. Siècle* (1825). Deputy for Evreux from July 1829, he was made a peer of France in 1832, and from 13th March 1839 to March 1, 1840 was Minister of Public Instruction. Reappointed on the 20th October, he was the leading promoter of the banishment of the Jesuits in 1844. About the end of that year ill-health forced him to forbear all mental labour, but in 1847 he had wholly recovered. After the establishment of the Empire, V. resigned all his appointments save his place in the Academy, to which he had been elected in 1821. The fruits of his leisure were *Études de Littérature Ancienne et Étrangère* (1846, 3d ed. 1865), *Tableau de l'Éloquence Chrétienne au IV. Siècle* (1846, new ed. 1870), *Souvenirs Contemporains d'Histoire et de Littérature* (1853, 2 vols. 1864), *Choix d'Études sur la Littérature Contemporaine* (1857), *Chateaubriand* (1857), *Essais sur la Génie de Pindare et la Poésie Lyrique* (1859), and *Histoire de Grégoire VII.* (2 vols. 1873). He died May 8, 1870. 'The French,' said Goethe, 'will never again see another genius like Voltaire; but V. is so superior to Voltaire in his point of view, that he can judge him in his merits and in his faults.' See Mager, *Geschichte der Französischen National-Litteratur neuerer und neuester Zeit*, vol. ii.

Villemar'qué, Théodore Claude Henri Hersart, Vicomte de la, was born at Quimperté, in Bretagne, July 6, 1815, and having early distinguished himself by his works on the Breton language and literature, received the decoration of the Légion d'Honneur (1846), and was admitted a correspondent of the Berlin Academy (1851), and a member of the French Academy (1858). Besides the works cited under BRETAGNE, V. has pub-

lished *Contes Populaires des Anciens Bretons* (2 vols. 1842), *Poëmes des Bardes Bretons du Sixième Siècle* (1850), *Notices des Principaux Manuscrits des Anciens Bretons* (1856), *La Légende Celtique en Irlande, en Camluè et en Bretagne* (1859), *Myrdhinn ou l'Enchanteur Merlin* (1860), *Le Grand Mystère de Jésus* (1865), &c.

Ville'na, a town of Spain, province of Alicante, 36¾ miles N.W. of the city of Alicante by rail. It has a town-hall, a palace, an hospital, and barracks. There are large brandy distilleries, and vines are cultivated extensively. A great fair is held every autumn. There is a large salt lake in the neighbourhood. Pop. (1876) 6600.

Ville'neuve, Pierre Charles Jean Baptiste Sylvestre De, a French admiral, born at Valensoles, Basses-Alpes, December 31, 1763, entered the navy in 1777, became captain in 1793, and captain-of-division in 1796. With this rank he commanded the rear division at the battle of the Nile, and succeeded in escaping to Malta with his own and four other vessels. In 1804 he became vice-admiral, and in 1805 was appointed to the command of the Toulon squadron, and ordered by Napoleon to divert the British fleet from the coasts of Europe in order to leave the Channel open for the invasion of England. With this view he sailed to the West Indies, and after cruising for a month recrossed the Atlantic, closely pursued by Nelson. At the Azores he fell in with a British squadron under Sir Robert Calder, which he fought till dark, and in the following morning bore away towards Brest, but was obliged to alter his course and sail to Cadiz, where he was blockaded by Nelson. The indignation of the Emperor, and the certainty of his being superseded, drove V. to risk an engagement with the blockading fleet, in the hope of repairing everything by a brilliant victory. Accordingly he sailed out of Cadiz and offered the enemy battle at Cape Trafalgar (q. v.). V.'s flag-ship, the *Bucentaure*, was captured, and the admiral carried as a prisoner to England. In the April of 1806 he was allowed to return to France, but learning that his reception by the Emperor would be unfavourable, he committed suicide at Rennes, April 22, 1806.

Ville'neuve-sur-Lot or **D'Agen**, a town of France, department of Lot-et-Garonne, on both sides of the Lot, 16 miles N.N.E. of Agen by rail. The part of the town N. of the river is connected with the Faubourg St. Etienne by the Pont-Neuf, a magnificent bridge of one arch with a span of 118 feet, and a height of 59 feet. V. has manufactures of linens, leather, boots and shoes, horn-combs, and pottery, and a considerable trade in corn, wine, and plums. Pop. (1876) 14,448.

Vill'i, the name given to those projections of the mucous membrane of the intestines which constitute the openings of the *lacteals* or *absorbent vessels*. The *chyle* or product of Digestion (q. v.) passes through the V., and is thence conveyed to the blood-system. The V. attain a length varying from a line to a line and a quarter, and may number from 50 to 90 per square line. The surface is coated with columnar epithelium, and internally are found blood-vessels and lacteal vessels.

Vill'on, François, one of the earliest French poets, was born at Paris in 1431. The few authentic details of his life which we possess are to be gathered from his verses, where he paints his own character in anything but favourable colours. His father was of humble rank, perhaps a shoemaker, and his mother appears to have been a woman of fine character, full of piety and love for her son. He began to attend the University of Paris, but soon deserted the lectures for evil courses of all descriptions, of which he makes full confession in many of his poems, and of which the *Repues Franches*, though admittedly not by V. himself, give a too faithful picture. He was in fact the first of the long series of literary Bohemians of Paris, always living at other people's expense, and very often carrying his love for the goods of others, or his boisterous debauches, to such a length as to land him in prison. Some exploit of this sort led to his removing in 1456 from Paris to Angers, and before leaving Paris he composed a burlesque will in verse, known as his *Petit Testament*. Next year, however, he was again in Paris, where he was shortly afterwards imprisoned in the Châtelet, and would probably have been executed but for the intervention of Charles d'Orleans. Again in 1461 we find him in prison, this time at Meury-sur-Loir, and after his release he seems to have composed his *Grand Testament*. After this his life is almost a blank. He is stated on the authority of Rabelais to have retired towards the end of his life to Saint-Maixent in Poitou, and also to have visited England. He died about 1487. His popularity may be judged from the fact that between 1489 and 1542 twenty-six editions of his poems were published in Paris and three in Lyon. The best modern editions are that in the *Bibliothèque Elzevirienne* (Par. 1854), that of M. Jannet (Par. 1867), and that of Paul Lacroix (Par. 1877). Several English translations have been made of his famous ballad, *Mais où sont les neiges d'Antan;* by Rosetti, among others. Swinburne has given us a version of the *Ballad of the Fair Armourer*, and an English translation of almost all his works has been privately printed by John Payne (Lond. 1878). See Besant's *Early French Poetry* (Lond. 1868), Campaux's *F. V., sa Vie et ses Œuvres* (Par. 1859), Nagel's *F. V.* (Berl. 1877), and Longnon's *Études biographiques sur F. V.* (Par. 1877).

Vil'na, a government of West or White Russia, surrounded by the governments of Kovno, Vitebsk, Minsk, Grodno, and Suvalki. Area 16,411 sq. miles; pop. (1870) 1,001,009. The surface forms an undulating sandy plain, with hill country in the S. and E. Except in the N.E., where Devonian sandstone and limestone occur, the formations are Lower Tertiary, consisting of layers of clay-slates, gravelly sandstone, coarse limestone, lignite, and marl. The rivers run to the Niemen, which forms the W. and part of the S. boundary, and whose chief tributary, the navigable Vilia, crosses from E. to W. the middle of V., while the Disna flows N.E. to the Düna on the N. border. There are in V. 400 small lakes, and numerous wooded marshes. Pine-woods, in which are found the elk, bear, wolf, boar, and glutton, cover 38 per cent. of the surface. The cereal products are rye, oats, buckwheat, and barley, the trade in which, as in wood, pitch, tar, turpentine, honey, and wax, is chiefly in the hands of Jews. V. is traversed by the St. Petersburg-Warsaw Railway. —**V.**, the capital, is situated on the Vilia, 42½ miles S.S.W. of St. Petersburg by rail. It has narrow and irregular streets, 18 squares, 2 large suburbs, called *Antokolla* and *Rudaishka*, a ruined castle, an imperial palace, a theatre, and the Oginski Palace, which is now used as government buildings. Of its churches 35 are Catholic (including the cathedral, with the tomb of St. Casimir and the great churches of St. John and St. Peter), 6 Russo-Greek, and 3 Protestant. There are also a synagogue, a mosque, and several Catholic and 2 Greek monasteries. The university, founded in 1576, was abolished in 1832, when the greater part of its library, observatory, and scientific collections were removed to St. Petersburg and Kiev. The other chief educational institutions of V. are a Catholic Priests' College, a Lithuanian Orthodox Priests' College, a Rabbinical School, a classical gymnasium, and 3 Hebrew schools. It has also an antiquarian museum, a deaf and dumb institute, and an orphanage, several factories and distilleries, and an active trade. V. is a very old town. In the heathen period it was a holy place. In 1387 Jagellon here introduced Christianity, and built the cathedral on the site of the old heathen temple. Pop. (1875) 64,200 (about 20,000 Jews).

Vinaroz', a town of Spain, province of Castellan, at the mouth of the Servol on the railway between Valencia and Tarragona, has some small trade in salt, oil, and wine, besides the building of fishing-boats. Pop. 9200. In November 1810 the French general, Musniers, defeated the Spanish army here.

Vin'ca. See PERIWINKLE.

Vincennes', or **La Pisotte'**, a fortified town and celebrated château of France, department of Seine, in an easterly direction from Paris by rail, 5 miles distant from the Louvre, near the right bank of the Marne, in the famous Bois de V. The town is in reality a great fortress, and has a large artillery work and park, a cannon-foundry, an arsenal, powder-magazine, and an École de Tir, at which officers of all regiments learn the use of arms, and to which the garrisons of Paris, &c., send contingents for practice. There are some manufactures of caoutchouc, starch, chemicals, leather, &c. Pop. (1872) 17,064. The château is in form of parallelogram, 1200 by 670 feet. An interior fort, known as the Donjon of V., is 170 feet high, and has walls 17 feet thick; it was originally flanked by nine towers, all of which,

except one, were removed when the building was being remodelled as the chief arsenal for Paris in 1818. The original building dated from 1137, and was used as a hunting-lodge by Louis VII. Begun by Philippe de Valois in 1333, the present château underwent expansion and change at various times, but was used as a royal residence till the time of Louis XV. The Duc d'Enghien was shot here. The Bois, which is adorned with lakelets, avenues, &c., covers an area of 4 square miles, and is a favourite resort of middle-class Parisians.

Vincennes', a city of Indiana, U.S., on the Wabash, 100 miles S.W. of Indianopolis by rail. It contains 10 churches, numerous schools, a 'university,' 2 bi-weekly and 3 weekly newspapers. Standing in a rich agricultural district, it has many large flouring-mills and some machine-works. V. is an important railway centre. Pop. (1870) 5440. It was settled by the French in 1702.

Vin'cent, St. See ST. VINCENT.

Vin'cent de Paul, St., founder of the great order of Sisters of Charity, was born at Pony in Guyenne, 24th April 1576. The leading impulse of his nature was pity, and so much was V.'s father struck with this, that he took him from herding sheep and sent him to be educated for the priesthood, into which he was admitted in his twenty-fifth year. He at once resigned all pretensions to a rich living to which he was presented because his right was disputed. On a voyage from Narbonne to Marseille he was captured by pirates and carried to Tunis, where he passed three years in slavery. The last of three masters he had was so affected by the piety of V. that he fled the country with him, the two arriving safely at the shores of France in a small boat (1607). Proceeding to Avignon to represent the sufferings of the European slaves in Africa to the Pope's legate, he was taken by the latter to Rome, where he was entrusted with a commission to the French king, Henri IV., who wished to make him a bishop. Through the influence of Cardinal de Berulle, who was deeply touched by the labours of V. for the inmates of an hospital, he was appointed almoner to Queen Marguerite de Valois, and to the Abbey of Chaume. But those preferments he soon resigned, in order to become pastor of Chatillon, near Lyon, because the living was so poor that no one would accept it. Having been persuaded to undertake the education of the children of the Marquis de Condi, he employed his leisure, when in the country, ministering to the peasantry, and when in the capital, visiting the galley-slaves. So much was he affected by the condition of the latter, that he set out for Marseille to act as a missionary among them, and even on these degraded criminals his teaching and example had a wonderful effect. There was one, however, whom he could not teach resignation, and he procured his release by taking his place for eighteen months. On his release he accepted the living of Chichi, and was appointed by Louis XIII. almoner-general of the galley-slaves. He next appears at the head of a vast organisation for establishing missions in France and foreign countries. In 1634 he founded the order of Sisters of Charity, which was recognised by the Pope in 1655. See BROTHERS AND SISTERS OF CHARITY. He did much to ameliorate the condition of the beggars of Paris, of the galley-slaves, and of the captives in Barbary (after spending 1,200,000 lires in redeeming so many); he sent alms and missionaries to the Hebrides, Poland, and Madagascar; and succoured the Maronites (q. v.), and the English Catholics during the Commonwealth. He was appointed extraordinary confessor to Louis XIII. on his death-bed, and after the death of that monarch head of the Conseil de Conscience. V. de P. died at St. Lazare, 27th September 1660, and was canonised in 1737. See Ansart's *Life of St. V. de P.* (New York 1868), and another edited by Canon Wilson (Lond. 1873).

Vin'dhya Mountains, a range of hills which extend across Central India, almost due E. and W. from the plateau of Chota Nagpur, overhanging the basin of the Ganges, to the shores of the Arabian Sea in Gujerat. Their total length is about 500 miles, and the highest peak does not exceed 6000 feet. The formation is granitic overlaid with sandstone. They form on the N. a continuous border to the Nerbudda, and with that river they are regarded as forming the traditional boundary between Hindustan proper on the N. and the Deccan on the S. The 'fourfold girdle round the waist of India' is completed by the Satpura range and the Tapti river.

Vine (*Vitis*), an extensive genus, numbering about 250 described species of climbing plants belonging to the natural order *Ampelideæ*. The branches are swollen at the nodes, separating from each other by an articulation; tendrils (abortive inflorescent branches) and the inflorescence are leaf-opposed; leaves alternate, or the lowest opposite, either simple and entire or lobed, or compound; flowers numerous, small, greenish, cymose, those of the Eastern species hermaphrodite, those of the Western incomplete and frequently diœcious; calyx somewhat 5-toothed; petals 5 or 4 cohering at the top, often lifted up by the stamens (equalling them in number), and falling off without expanding; ovary sessile, 2-celled; fruit a 2-celled globular berry; the cells 2-seeded, but by abortion often 1-celled and 1-seeded. The majority of the species are natives of tropical and temperate Asia as far N. as Japan, tropical Africa, and N. America, while none are confidently recognised as indigenous to Europe. The best-known and most important species is *V. vinifera*, the grape V. It is indigenous in Armenia, the Caucasus, other parts of W. Asia, and possibly also in Bulgaria, Thracia, and Greece. In the N.W. Himalaya, also, this V. is often found apparently wild, but wherever cultivated under favourable climatic conditions it spreads rapidly. It is certain that its cultivation in Syria and Greece is as old as the oldest historical records of those countries; that Greek colonists and traders imported it into Italy at an early age; that from W. Asia and S.E. Europe its cultivation has spread over other portions of Europe; and that from Europe it has been introduced to the Azores, Madeira, the Cape, Australia, and N. America. The present northern limit of vineyards on a large scale is 47° 30′ N. lat. in the Bretagne, and thence runs eastward, slightly tending towards the N., crossing the Rhine at 50° 45′, and attaining its northernmost point in Silesia at lat. 51° 55′. The comparison of this line with the lines of equal temperature during the different seasons, shows that it is the want of sufficient summer heat which prevents its profitable cultivation further N. in Western Europe. In the Middle Ages, however, there were vineyards in the S. of England, and not far from the Baltic. Excellent grapes are grown in parts of India. The mode of cultivation of the V. varies in different countries. Success is chiefly dependent on a good sunny exposure, liberal but not coarse manuring, and constant attention. New varieties are raised from seed, but the ordinary modes of propagation are by layers and cuttings. Fine varieties are budded or grafted on strong-growing stocks of inferior varieties. In British vineries the V. is carefully trained in various ways on walls and trellises, the superfluous shoots are removed by pruning so as to direct strength to the fruit-bearing branches, and the foliage is thinned so as to give free access to light and air. The luxuriant growth of the plant renders the frequent application of the pruning-knife necessary during summer. Few plants more readily adapt themselves to surrounding circumstances than the V., but for the production of grapes of the finest quality certain conditions must be complied with—(1) The soil in which the plants are growing, and, if possible, the subsoil also, must be free from stagnant water; (2) the soil must be free and porous; (3) it must be free from rich, raw, and stimulating manures, but contain sufficient stimulant of a permanent character, such as bones, charcoal, and burnt earth, to yield the food necessary for the proper and constant sustenance of the plant. The V. mildew (see OIDIUM) and the insect pest Phylloxera (q. v.) have in recent years caused great loss to V. growers. The most important products of the grape V. are wine and vinegar, the one obtained by vinous and the other by acetous fermentation; brandy, a product of distillation; and raisins and currants, which are both the dried fruits. Grapes are sent to Britain in large quantities from France, Spain, Portugal, and Holland, generally packed in sawdust, and are retailed at a cheap rate. The home-grown hothouse grapes always command a proportionally high price. The wood of the V. is remarkable by its numerous large medullary rays and exceedingly numerous pores, giving it the appearance of a sieve. In spring it yields an abundance of clear watery sap, which rises with great force, and in France is a popular remedy for chronic ophthalmia. The leaves on account of their astringency have been used in diarrhœa.

Among other species of *Vitis* claiming notice are the following:—*V. acetosa* of N. Australia, which has proved valuable in cases of scurvy; its berries are edible. *V. Baudiniana* of E. Australia, the most southern-growing species; it fruits freely, and the berries though small are edible. *V. cordifolia* of Canada

and United States is noted for the exquisite scent of its flowers; the fruit is used for preserves. *V. hypoglauca* of E. Australia, an evergreen climber of enormous length; the black berries attain the size of cherries. *V. Indica* of mountainous districts in India; berries small but edible. *V. quadrangularis*, common through tropical and sub-tropical India; berries very acid, leaves and tender shoots eaten. *V. Labrusca*, the Isabella grape of N. America; the berries are pleasant-tasted, and large among American kinds; several varieties are grown, and are not liable to the oidium disease. *V. Schimperiana* is a representative of African grapes, and may hereafter prove serviceable. *V. vulpina*, the Muscadine or fox-grape of the S.E. United States, includes several cultivated varieties of America; the fruit has a pleasant taste, and is of large size (see Planchon's *Les Vignes Americaines*, Par. 1875). The pigment of the purple grape is known as Oenolic acid; the juice contains tartaric acid and grape acid. See Babo, *Der Weinstock und seine Varietäten* (new ed. Frankf. 1857); Roth, *Der Rheingauer Weinbau* (Frankf. 1878); and Vizitelly's well-known work (new ed. 1879).

Vin'egar is a solution of Acetic Acid (q. v.), usually containing from 2 to 5 per cent. of acid, and minute proportions of various ethers and other substances according to the sources whence it is derived. V. is a product of the oxidation of alcoholic solutions, and may consequently be prepared from any body containing alcohol, or capable of being transformed into that substance. In practice it is prepared from malted barley or other grain (malt V.), from wine of inferior quality (wine, French or Orleans V.), from dilute solutions of spirit (spirit V.), and from cider (cider V.). Wood V., a product of the destructive distillation of wood (see PYROLIGNEOUS ACID), is used chiefly in connection with chemical operations, and although deficient in flavour and other qualities it is in extensive use as a table V., and for the various other purposes to which common V. is usually applied. The circumstances which are necessary for and favour the production of V. are, 1st, an alcoholic solution (or a solution capable of developing alcohol) containing not more than 10 per cent. of spirit; 2d, a suitable temperature, which may range from about 45° to 100° F.; 3d, free access of atmospheric air; and, 4th, the presence of substances which promote acetification or oxidation of the alcoholic solution, the chief active agency being the V. fungus *Mycoderma aceti*, which acts as a carrier of oxygen to the solution. There are two principal processes by which ordinary V. is prepared, termed respectively, 1st, the old or slow process; and, 2d, the quick process. The slow process is still largely used in the preparation of French or wine V., and it is also used in making British malt V. In the manufacture of the latter there are a number of preliminary operations analogous to those employed in brewing. A mash of mixed malt and unmalted barley is prepared, and the wort is permitted to ferment. After completion of the fermentation the liquor is run into barrels, the tops of which are open but tied over with coarse canvas, and stored away in darkened but moderately-heated chambers where there is free access of air. There the acetous fermentation takes place slowly during several weeks or even months, when the contents of the barrels are emptied into two large tuns having false bottoms, over which the pressed cake from making currant wine, &c., is strewed. One of the tanks is filled entirely, but the second is only three-fourths filled. Here the acetous fermentation proceeds vigorously, and when the V. is ready a portion is drawn from the second (unfilled) tun. The quantity withdrawn is made up from the full tun, and it again is filled up from the barrels. In this way the manufacture goes on progressively. The old or slow method of V.-making is a system requiring extensive premises and plant, and to a large extent it is now supplanted by the new or quick process. The principle upon which the various quick methods in operation depends consists in exposing the alcoholic solution at a favourable temperature in the most intimate manner to the action of the atmosphere. The solution is made to trickle drop by drop through one or more columns containing beech shavings or other means of fully exposing the fluid to the air, and as it descends it meets a current of air ascending. In this way rapid and complete oxidation is promoted. V. on a domestic scale is prepared from saccharine solutions to which the V. fungus *Mycoderma aceti* is added, the solution being covered up and kept in a warm place till the acetification is complete. The use of V. in the manufacture of pickles, the preparation of salads, and of acid beverages, as well as directly as a sauce with animal food, is very extensive. It is also an important substance in medicine, both for internal and external use, and its pungency combines in a very refreshing manner with various perfumes for toilet purposes. V. is a valuable aid to the digestion of the hard fibrinous and albuminous constituents of food. The qualities of V. depend principally on the source whence it is obtained, the best being wine V., after which comes that prepared from pure malt. Inferior V. is frequently contaminated with sulphuric acid, of which by law one part per thousand is permitted to be present without being counted an adulteration.

Vin'egar Eel (*Anguillula aceti*), a small species of *nematoid* worm, inhabiting vinegar. The V. E. is one of the 'free' or non-parasitic nematoids. The young are produced in large numbers, and frequently by a process analogous to asexual methods of reproduction.

Vin'egar-Plant is the name popularly given to the fungus mass that covers the surface of liquids during the process of acetous fermentation, and which, if placed in a solution of sugar in water and kept at a proper temperature, assists materially in converting the mixture into vinegar. The V.-P. consists of interlaced delicately-branched threads, and under favourable conditions for development produces a common mould known as *Penicillium glaucum*. See MOULD.

Vine'land, a town of New Jersey, U. S., 34 miles S. of Philadelphia by rail. With the exception of a few blocks in the main avenue, the town is laid out in fruit-farms of from 5 to 25 acres, and resembles a vast park. It has 10 churches, numerous schools, flour, wood, machine mills, &c. There are 2 daily and 4 weekly newspapers. In 1875, 345,791 quarts of berries, 23,784 crates of peaches, and 1,210,188 pounds of grapes were exported. Pop. (1870) 11,000. V. was founded by Charles K. Landis in 1861 on 'temperance' principles. The cultivation of fruit forms the chief industry.

Vi'net, Rodolphe Alexandre, born at Ouchy, June 17th, 1797, and educated at Lausanne. As early as 1814 a patriotic song from his pen, *Le Reveil des Vaudois*, became popular. In 1817 he was called to teach French at the gymnasium, and 'pædagogium' of Basel, and two years later he became a minister of the national church. About this time a religious 'revival' was taking place in this part of Switzerland. At first V. wrote against the movement, but before the close of 1823 he had completely changed his views, and in 1824 he took up the cause of the much-persecuted dissidents in his *Respect des Opinions*. The general principles of religious liberty enunciated in this little work received fuller treatment in a *Mémoire en Faveur de la Liberté des Cultes* (Paris 1826), in which he claimed that there should be the completest severance of Church and State. In 1835 he was appointed professor of French literature in the university of Basel, and in 1837 he removed to the chair of practical theology in Lausanne. Two years later, on the enactment of the law of 1839, by which the Church was made more dependent than ever on the State, V. renounced his clerical status, and in 1845 he gave up his theological professorship, but was almost immediately appointed to the chair of French literature. In 1846 his co-operation with the 'free church' movement led to his ejectment. He died at Clarens, near Vevey, 4th May 1847. Among the more remarkable of V.'s works are *Études sur la Littérature Française au XIX. Siècle* (Par. 1849–51, 3 vols.); *Études sur Blaise Pascal* (Par. 1848; 3d ed. 1876); *Hist. de la Litt. Franç. au XVIII. Siècle* (Par. 1853, 2 vols.); *Moralistes des XVI. et XVII. Siècles* (Par. 1859); *Hist. de la Predication parmi les Réformés de France* (Par. 1860). See Fred. Chavannes, *Alex. V., Notice et Mémoires* (Neuchâtel 1847); Sainte-Beuve, *Derniers Portraits Littéraires*, vol. ii.; Scherer, *Alex. V., Notice sur sa Vie et ses Écrits* (Par. 1853); E. Rambert, *Alexandre V.* (3d ed. 1877); and Montet, *Dict. Biographique des Genevois et des Vaudois* (Lausanne 1878).

Vin'land ('wine-land'), the name applied by the Northmen to that part of the E. coast of N. America which includes Massachusetts and Rhode Island. It was first discovered in 986 by Bjarne Herjulfsson on his voyage from Iceland in quest of his father, who had gone with Erik the Red to Greenland; but it was not till 1000, when Leif the Lucky, a son of Erik, sailed on a voyage of discovery with Bjarne's ships and a crew of thirty-five men, that the Northmen landed upon the conti-

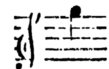
nent. The first land they touched being rocky and icebound, they named Helluland ('rock-land'); the next, further southwards, Markland ('wood-land'). Sailing still further southwards, they landed upon a coast where one of the sailors, a German named Tyrker, found the vine growing, from which the country was called V. Here Leif and his sailors built themselves wooden huts ('Leifsbudir'), and remained until the approach of spring, when they sailed to Greenland, their ship laden with grapes and building-timber. Seven years later, Thorfinu Karlsefne led 160 men to settle in V., but after staying three years the colonists returned to Greenland. The connection, however, was kept up to the 12th c., as it is known that Erik, first Bishop of Greenland, visited V. in 1121. The visit of Columbus to Iceland in 1477, which has been satisfactorily established by Finn Magnusen, is especially interesting from the probability that there he may have heard of the existence of land beyond the Atlantic, and have had his ambition roused to follow in the track of the old Northmen, fifteen years before he became the discoverer of America. See Rafn, *Antiquitates Americanæ* (Copenh. 1837), and Wilhelm, *Hvitrammanaland, Grönland und V.* (Heidelb. 1842).

Vinnit'za, a town of Russia, government of Podolia, on the river Bug, 45 miles N.N.W. of Odessa by rail. It has six churches, a Russo-Greek monastery, a Capuchin monastery, two synagogues, several schools, and a military hospital (formerly a Jesuit college). Pop. (1875) 18,780.

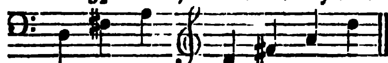
Vin'sauf, Geoffrey de. See GEOFFREY DE VINSAUF.

Vi'ol (Ital. *viola*; Med. Lat. *vitula*), a stringed instrument played with the bow, which preceded the violin. The Spanish V. of the 12th c. was called a vilhuela, and resembled a rebec. The latest form of the V. was a flat instrument, with larger curves at the side than the violin, and with a fretted finger-board, manipulated by the left hand. It had from 3 to 6 strings, which were probably tuned in fourths and thirds. In the 17th c. the most popular bow instruments were the treble, tenor, and bass viols, and V.-players usually had chests containing six viols of different sizes and pitch. In Germany the various kinds were called the bratsche, the schultergeige, and the bassgeige. In Italy the smaller kind of V., from being held by the arms, was known as the 'V. di braccio;' and the larger, which rested between the knees, the precursor of the violoncello, the 'V. da gamba.' The 'Viola Pomposa' was a species of V. da gamba invented by J. Sebastian Bach.

Vi'ola, the tenor violin, a musical instrument holding a position between the second violin and the bass. It is the German *bratsche*, and is sometimes called the *alto* V., from the music being written for it in the alto clef. It has four strings, the two lower of which are covered with silvered copper wire, tuned in fifths, thus one octave above the violoncello. Its compass ranges from to



Vi'ola d'Amo're, an almost obsolete instrument of the violin class, which had from five to seven metal strings under the finger-board, in addition to the same number of ordinary catgut strings, producing a peculiar sweetness and delicacy of tone. Those metal or sympathetic strings were tuned in unison or in octave with the others, and required to be made of wire of an exceeding thinness very difficult to obtain. The instrument had a compass of about 3½ octaves, and was usually tuned thus



Meyerbeer and Berlioz endeavoured to revive its use in the orchestra, the former composer having written an obligato part for it in the first act of the *Huguenots*.

Vi'olent Prof'its are, in Scotch law, the income from heritable (real) estate, during the forcible detention of it by a tenant after he ought to have given it up. In an action for removing, a tenant is usually required to find security for the V. T.

Vi'olet (*Viola*) is the type genus of *Violaceæ*, a natural order containing 21 genera and about 250 species of herbs or shrubs distributed through temperate and tropical regions of both hemispheres. It belongs to the thalamifloral subdivision of dicotyledons, and is distinguished by having alternate stipulate leaves; irregular often showy flowers with 5 sepals, 5 petals, and 5 stamens; the ovary is 1-celled, with parietal ovules; style 1; capsule 3-valved; seeds albuminous. The properties are emetic and laxative, and the root of *Ionidium Ipecacuanha* and *I. microphyllum* is used medicinally in Brazil and Venezuela. The order does not enter into British Pharmacopœias. The genus *Viola* numbers upwards of 100 species, represented in all temperate countries, and contains several familiar plants. The pansy of the gardens is the result of continued cultivation and crossing of several species of V., one of which, the common heartsease (*V. tricolor*), is an abundant and variable plant of cornfields, &c., in Britain, and others are *V. altaica* from Siberia, and *V. calcarata*, a native of Central Europe. Florists demand that a show pansy shall measure fully 1½ inches across, have a flat, round, and very smooth edge, the petals thick and velvety, the lower three alike in their ground colour with bright and distinct pencillings, and the two upper perfectly uniform. The sweet-scented V. (*V. odorata*) is another favourite. It is spread over Europe, N. Africa, and Western Asia to the Himalaya, is wild in England, but does not appear to be native in Scotland. Numerous forms and varieties of it are grown for the delicate fragrance of the flower, and the plant is extensively cultivated for perfuming purposes. The name dog V. is popularly applied to the scentless violets of the same group as the sweet V., the cognomen denoting their worthlessness. The name therefore includes the several species that along with the primrose so profusely deck the banks and open woods through Britain in the spring months. V. is used in conjunction with some other word for several plants not belonging to the genus *Viola*. For water V. see HOTTONIA. Dame's V. (q. v.) is a cruciferous plant, and the dog's-tooth V. (*Erythronium dens-canis*) belongs to *Liliaceæ*. The V. is the emblem of the Napoleon family.

Vi'olin (diminutive from *viol*), the most perfect of solo musical instruments, stringed, and played with a bow. It consists of a wooden chest formed by two slightly curved surfaces—the belly and back—united by sides or ribs hollowed at the half length, to which is appended a neck or finger-board. Four strings of thin gut, the fourth being covered with silver wire, are stretched from a tail-piece at the foot of the chest to the head of the finger-board, where they are received by turning-pins, which tighten or loosen them at pleasure. The strings are raised above the belly by a bridge, convexly curved, so that the bow may be drawn across each separately. The belly is usually made of soft deal and the back and sides of maple. The excellence of a violin depends greatly upon the thickness and collocation of the wood and the nature and direction of the curves. The grain of the wood should be very regular. A certain fixed relation should always lie between the air-bearing capacity of the chest (as fixed by the height of the sides or ribs) and the thickness of the wood. There are two sound-holes in the belly in the shape *f* *f*. The outside of the instrument is varnished while the inside is plain. The outer coat of varnish drives the sound inwards, whence it escapes through the sound-holes. The bow, which is held in the right hand, is strung with horse-hair powdered with rosin.

The V. is tuned in fifths, thus—

Every intermediate semitone in its ordinary compass of 3½ octaves (from to may be produced by stopping the strings. Chords of two notes may also be played, and several notes in arpeggio. The compass may be almost indefinitely extended upwards by the harmonics produced by touching the strings lightly. The violin has great capabilities of execution, and a power of expression quite unparalleled, every gradation of quality and tone being obtainable from it. It is the

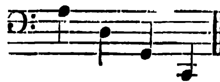
most susceptible and sympathetic of instruments, following the ideas and caprice of a master with astonishing fidelity and marvellous completeness. The sound may be modified by the use of the mute or sordino. The effect produced by plucking the strings with the fingers in guitar fashion is called *pizzicato*.

Not only does the V. play an important part in solo music. In its two forms, 1st and 2d V., and with its kindred instruments the viola and the violoncello, it forms the basis of all orchestral music, the string quartette being indispensable to a musical score. Many of the finest works of the great masters have been written for these four instruments alone.

The invention of the V. has been claimed by various nations, but strings stretched across wood were probably found a pleasing method of producing musical sounds at different periods and places independently. The Hindus have a bow instrument of great antiquity, names for it occurring in Sanskrit, a language which ceased to be spoken about 300 B.C. They maintain that the revanastron, of which the modern representative is the chikarah, was invented 5000 years ago by Ravanon, a king of Ceylon. The Chinese have an ancient instrument with two strings, played from below with a bow, but with no finger-board. The rehab, the kermangeli, the Scandinavian gaddok, the Welsh crwth, the rebec, the Old English fithele (the fiddle), are varieties of the precursors of the V. In the rebec we have the rounded form and the sound-holes, in the crwth the important detail of the back and belly joined by two sides, in the guitar the elongated neck. There is a drawing in an MS. in the British Museum of an Old English fithele of the 11th c. of pear-shape, with 4 strings and no indication of a bridge. In the 16th c. the V. seems to have been elaborated from the viol. A V. dated 1578, given by Queen Elizabeth to the Earl of Leicester, is essentially the same with that now in use. Gasparo di Salo of Brescia was the first great Italian maker. Andreas Amati was the founder of the illustrious Cremona school. His reputation was maintained by his sons Jerome and Antonius, and excelled by Nicolas the son of Jerome, who produced violins of an unprecedented mildness and sweetness of tone. But the greatest of all makers was his pupil Stradivarius or Stradivari (q. v.), who by unwearied experiments and dexterous manipulation attained an excellence never since equalled. His violins are of exquisite beauty and perfect workmanship. The improvements he made upon the Amatis violin, in the size and shape of the chest and the sharp and beautifully cut sound-holes, have become permanent. His varnish has a reddish tinge instead of the yellow used by Amatis. The sound of a Stradivarius V. has a splendid richness and fulness. The classic signature 'Antonius Stradivarius, Cremonensis, faciebat, Anno,' has often been forged, but no imitation can deceive the expert, or can approach the finish of the genuine work. Jacob Stainer, a Tyrolese, was a maker of great reputation, and his high and narrow violins are still much valued for their sharp and piercing tone. Although the V. is so sensitive as to require tuning on every occasion, and to feel every change of weather like a barometer, it is of great hardiness, can stand almost any amount of wear and tear, while age and constant use seem to improve it rather than the reverse. Those by the great makers fetch sometimes as high sums as £500. The most celebrated modern factory is that of Villaume at Paris. See Otto's *Treatise on the Structure and Preservation of the V.*, Sandys & Forster's *History of the V.*, Fetis' *Antoine Stradivari, précédé de Recherches historiques et critiques sur l'origine, &c., des Instruments à Archet* (Par. 1856), Haweis' *Music and Morals* (2d ed. Lond. 1873), George Hart's *The V.; its famous Makers and their Imitators* (Lond. 1875), Niederheitmann's *Cremona* (Leip. 1877), and Vidal's *Les Instruments à Archet* (2 vols. Par. 1876–77).

Vi'ollet-le-Duc, Eugène Emmanuel, born in Paris, 27th January 1814, studied ancient art at Rome and Taormina (1836–37) as well as in the cities of Southern France, and in 1840 was charged with the restoration of the exquisite Sainte Chapelle. Since then he has been employed on many of the historic monuments of Gothic art in France, notably Notre Dame (1846), and as engineer he assisted in the defence of Paris (1870–71), while playing in politics the part of a hot republican. He is author of *Dictionnaire raisonné du Mobilier Français de l'époque Carlovingienne à la Renaissance* (6 vols. 1854–72), *Lettres sur la Sicile* (1860), *Chapelles de Notre Dame de Paris* (1869), and *L'Art Russe* (1877); and other works by him have been translated under the titles *Military Architecture of the Middle Ages* (1860), *How to Build a House* (1874), *Annals of a Fortress* (1875), *Habitation of Man in all Ages* (1876), *Lectures on Architecture* (1877), and *Mont Blanc, its Geodesical and Geological Constitution* (1877). His pamphlet on *Restoration* (Eng. trans. 1876) contains a survey of his architectural undertakings.

Violoncello (the little violone or double bass) is a large stringed musical instrument, held by the performer between the knees, and filling a place between the violin and double bass. Its tone is powerful, and in the higher register most sympathetic, while it has a resource almost equal to the violin, which it closely resembles in construction. It supplied the place of the bass viol or viol da gamba. It has four gut strings, the lower two being covered with silver wire. It is tuned in fifths one octave lower



than the violin, and has an ordinary compass of from



Soloists can play an octave higher. The signature is in the bass clef, the tenor or treble being used for high notes. It is usually coupled in the orchestra with the double bass, and as it gives rapid passages with more certainty than the latter instrument, the intermediate notes of a passage are generally assigned to it, while the double bass takes the essential.

Viott'i, Giovann'i Battis'ta, a master of the violin, was born in Piedmont, 23d May 1753, and in early life was first violinist in the chapel royal at Turin. In 1778 he undertook a professional tour through Germany and Russia, and four years later took Paris by storm with his brilliant execution, and the finish, energy, and grace of his style. He removed to London on the Revolution, where he created a similar sensation, and ultimately became leader of the orchestra at the King's Theatre. In 1798 he had to leave this country on an ill-founded suspicion of holding revolutionary views. After a residence in Hamburg he returned to London, where he died, 10th March 1824. V. composed twenty-nine concertos for the violin, and a great number of string quartets, trios, &c.

Vi'per (Lat. *vipera*, from *vivus*, 'alive;' *pario*, 'to bring forth'), the name given to the adder (*Pelias berus*), the only poisonous British snake, from its habit of retaining the eggs within the body until the young are hatched. This snake is therefore said to be *ovo-viviparous*. The V. is typical not merely of a sub-order (*Viperina*) of the order *Ophidia* (or that of the snakes), but also of a family *Viperidæ*. The sub-order *Viperina* is distinguished by the absence of true teeth in the upper jaw, this bone bearing merely two *canaliculated* poison-fangs, with a few rudimentary teeth behind, destined to replace the latter in event of their being lost or injured. The fangs are capable of being erected or depressed at will. They communicate internally with a poison-gland, the contents of which are ejected through the canal of the fang into the wound they inflict. The lower jaw has numerous solid teeth of ordinary shape and form. The head of the viperine snake is broad at the middle, and is separated from the body by a well-defined neck, while the head is covered with small scales. The family *Viperidæ*, to which the vipers and their typical allies belong, is distinguished by the shields or scales of the belly being large and arranged in band-like fashion, while the head has no pit or depression between the eye and nostrils.

Of the V. family the best-known example is the Common V. above named. Its average length is about 18 inches. Its colour varies, but is usually an olive-brown, marked along the back with a prominent series of black zigzag markings. These serve to distinguish the V. from the Common Snake of Britain. The sides are also marked with small triangular black patches. The bite of the V. is not necessarily fatal, save to weakly persons and to children. The food of the V. consists of mice, frogs, birds, &c. The eggs are deposited at the beginning of summer, and number about 20.

The name 'V.' as a generic term is given to such serpents as the Water V. (*Cenchris piscivorous*), a common American snake, which lives in water and feeds on fishes. It attains a length of 2 feet, and is of a greenish brown, marked with black,

The Horned V. or horned adder (the *Cerastes Hasselquisti* of N. Africa) gets its name from the horn-like scale which protrudes over each eye. The Death V. (*Acanthophis Antarctica*), an Australian snake, is named from the fatal effects of its bite.

Viper'idæ. See VIPER.

Vi'per's Bu'gloss (*Echium*), a genus of *Boraginaceæ* numbering twenty species of usually large herbs (sometimes shrubby) rendered hispid or scabrous by an abundance of tuberous-based hairs. The leaves are entire; the flowers white, red, purple, or blue, in spiked or panicled racemes; the calyx five-partite; the corolla irregular, open at the throat; the stamens exserted; the style filiform. The genus predominates in the Mediterranean region and the Orient; shrubby species are met with in the Canaries and in S. Africa, and are highly ornamental. *E. vulgare* is one of the most showy of British native plants, and is of frequent occurrence in light soils. Its seed bears a miniature resemblance to the head of a viper—hence the name V. B.

Virch'ow, Ru'dolf, was born 13th October 1821, at Schivelbain, in Pomerania, and received his medical education in Berlin, where he was a favourite pupil of Johann Müller's. He was rapidly rising into fame as a lecturer in the Berlin University when his political action deprived him of his official appointments (1849). He was at once called to be professor of pathological anatomy at Würzburg. In 1856 he returned to Berlin, where he still continues to take equal interest in science and politics. As a scientific man he is the founder of cellular pathology, and has done immense service by his discoveries in regard to inflammation, ulceration, tuberculosis, and a hundred other morbid processes of the human frame. As a politician he is a strenuous Liberal, and in the Prussian Parliament, to which he was called in 1862, he has been one of the most powerful opponents of Bismarck, who in 1865 after the defeat of the Navy Bill challenged him to a duel. It is to V. that Germany is indebted for the word *Kulturkampf* as a designation of the great political struggle of the time. He was one of the founders of the German Anthropological Society in 1869. Since 1856 he is an honorary member of the Royal Society of Medicine of London, since 1859 a corresponding member of the French Academy of Medicine, and since 1873 a member of the Berlin Academy of Sciences. V. has been a voluminous writer. Among purely scientific works are *Cellular Pathologie* (4th ed. Berl. 1871; English trans. Lond. 1860); *Abhandlungen zur Gewissenschaftlichen Medicin* (Frankf. 1856); *Ueber Die Entwickelung des Schädelgrunds* (Berl. 1857); *Ueber den Hungertyphus* (Berl. 1868; English trans. Lond. 1868). Of more general interest are *Die Aufgabe der Naturwissenschaften in dem neuen Nationalen Leben Deutschlands* (Berl. 1871); *Die Freiheit der Wissenschaft im modernen Staat* (Berl. 1877).

Vire, a town of France, department of Calvados, stands 168 miles W. of Paris by rail. It has important manufactures of cloth, paper, and glass, and carries on a trade in hides and wool. Pop. (1872) 6778. In the immediate neighbourhood is the beautiful valley, Vaux de V.

Vi'ret, Pierre, a Huguenot theologian, born at Orbe in the Pays de Vaud in 1511. Along with Farel (q. v.) he was one of the earliest preachers of the Reformation in Switzerland. Having held ministries at Geneva and Lausanne, he was summoned towards the close of his life by the Queen of Navarre to teach theology at Orthez, where he died in 1571. A brilliant orator and vehement writer, V. was the author of *Exposition Familière sur le Symbole des Apôtres* (1543), *Disputations Chrétiennes* (1544), *Satyres Chrétiennes de la Cuisine Papale* (1560), &c. See Jacquemot, *V., Réformateur de Lausanne* (Strasb. 1836).

Virgil'ius (properly **Vergil'ius**) **Maro, P.,** the greatest of the Roman poets, was born at Andes (now *Pietola*), a hamlet about 2 miles from Mantua, on the 15th October 70 B.C. He received his first education at Cremona, whence, after assuming the *toga virilis* at sixteen, his father, a small landed proprietor, sent him to Milan, and finally to Rome. There he at first studied rhetoric under Epidius, but soon finding himself unfitted for the bar, turned to philosophy and natural science under the Epicurean Siron. His love for these studies is amply proved from his writings, and he is said to have purposed, after the completion of his *Æneid*, to devote to them the remainder of his life. Before the outbreak of the civil war in 49, V. had returned to Andes, where he continued till 41, when his father's property was seized in the division of lands among the soldiers of Antonius. V. appealed to C. Asinius Pollio, legate of Antonius in Transpadane Gaul, who gave him letters of recommendation to Octavianus, which soon procured for him an order for the restoration of his farm. But within a year it was again torn from him, and V. retired with his father to the villa of Siron, near Rome. Mæcenas soon after became his patron, and Octavianus either restored his lands or gave him new. Henceforth the friendship of Mæcenas and of the Emperor secured him leisure and a competence, and he lived chiefly at Naples, sometimes at Rome, in a house near that of Mæcenas, on the Esquiline. Hard study enfeebling his naturally weak constitution prepared his early death, which befel at Brundisium, 21st September 19 B.C., on his return from a stay in Greece. He was buried within the second milestone on the road from Naples to Puteoli. He left half of his estate to his half-brother, one-fourth to Augustus, and the rest he divided equally between Mæcenas and his friends Varius and Tucca. V. was tall and slender, of dark complexion and plain features, slow of speech, and shy and retiring of disposition. By 38 he had published his *Bucolica*, probably in the received order, while most likely the order of their composition was as follows: 2d, 3d, 5th, 1st, 9th, 4th, 6th, 8th, 7th, 10th. These *Eclogæ* are sweet and elegant short poems, full of complex beauty and varied music. With them V. founded the *artificial* school of pastoral poetry, and in them he bears the same relation to his model Theocritus that Pope (as a pastoral poet) does to Allan Ramsay, or Shenstone to Burns. In Italy they have been imitated by Tasso and Guarini, in Spain by Garcilaso de la Vega, in France by Florian, and among English poets by Spenser, Milton, Drayton, Drummond, Pope, Shenstone, Phillips, and Gay. At Mæcenas' instance V. began his *Georgica* about 37. It was published about 31. This highly-finished work, which V. himself calls an Ascræan (*i.e.*, Hesiodic) poem, and Dean Merivale 'The Glorification of Labour,' gives its author the unquestioned title of prince of didactic poets. Much of its spirit and poetry is drawn from Lucretius, but it is original in its idea, its fine sympathy with nature, its splendid description, delicacy of feeling, skill in arrangement, and varied majesty of verse. Thomson's *Seasons* is the chief of its English imitations, which include also Phillips' *Cyder* and Dyer's *Fleece*. About 29 V. began his greatest work, the *Æneis*, 'The Imperial Poem, and Mirror of the Glory of Rome.' He left it still unfinished at his death, when he instructed Varius and Tucca, his literary executors, to burn it; but by command of Augustus the whole was published intact. V. was all his life a student, and in his *Æneid*, which teems with exact descriptions of religious detail, and is embellished like *Paradise Lost* with great wealth of local allusions, he drew on all the vast storehouse of Greek literature and heroic legend. The story of Æneas and his Trojans wandering to the W. and 'founding the Roman race' was prepared by Stesichorus (600 B.C.) and Timæus of Tauromenium (262 B.C.), and was already incorporated in the *Annals* of the Pontiffs. It exactly suited V.'s purpose for a heroic poem on the origin of Rome and the glory of the Julian gens. Rome and Augustus are always before the poet of the *Æneid*. Anchises, in the shades, yields indeed to Greece the palm of art and science, but for Greek liberty and valour he has no praise, his climax is the grandeur of Rome, ''Tis thine, O Rome! to rule; this mission ne'er forego.' V. was unanimously accepted in his lifetime as the perfect exponent of the idea of Roman world-dominion. The fixed order of nature revealed in the *Georgics* has its counterpart in the *Æneid* in the coherent body of universal law that Fate impelled the inexorable *imperium* of Rome to stretch from the Euphrates to the Rhine. If the majestic simplicity of the *Georgics*, preaching the revival of early virtue and rural toil, first presented Italy as a living whole, it is in the *Æneid* that the imperial thought of the destiny of the eternal city, which has swayed Italian minds from Ennius to Mazzini, finds its supreme expression. 'The *Georgics* had been the psalm of Italy, the *Æneid* was the sacred book of the religion of Rome.' And though it is not true that 'V.'s eyes first saw the star of Bethlehem,' there is in V. an ever-recurring tone of mystic hope in a glorified future for humanity that has appealed to Christians of every age, from Augustine to Keble. 'It was given to V.,' said St. Beuve, 'at a decisive hour in history, to divine what the future would love,' and even 'in his single words and phrases, his pathetic half-lines,' Newman hears 'utterance, as the voice of Nature herself, to that pain and weariness, yet hope of better

things, which is the experience of her children in every time.' The reputation of V. was above Homer's for centuries. The early Christian writers, especially St. Augustine, are deeply imbued with his spirit, and to Dante V. was 'the master and guide from whom alone he derived the beauty of his style.' V.'s rank was never higher than in the period between Milton and Goethe. Bossuet knew him by heart. Burke had the *Æneid* always open by him. Immense also has been V.'s influence on education in ancient Rome, in the Middle Ages, in modern times. Few writers have been so often quoted, and if we forget Niebuhr's disparagement of 'the chastest poet, and royalest, that to the memory of man is known,' nineteen centuries join in the words of Macrobius, 'Such is the glory of Maro, that no man's praise can add to it, no man's blame diminish it.' The *editio princeps* of V. was published at Rome in 1469, since which date, says Heyne, no year has been without at least one edition. Servius' valuable commentary (A.D. 395) was first edited in 1471. Among the most important editions are De la Cerda (Madrid 1608-17); Nic. Heinsius (Amst. 1664); Burmann, with Heinsius' notes (Amst. 1746); Heyne (1767-88); Heyne-Wagner (1830-41). Among Virgilian scholars the greatest names are Burmann, Martin, Mittaire, Baskerville, Heyne, Wagner, Forbiger, Keightley, Conington, Gossrau, Ribbeck, Boissier, Kennedy, and Sellar. See the editions of Ribbeck (5 vols. 1859-68), Conington (3 vols. 1865-71), Ladewig (3 vols. 1870), Forbiger (4th ed. 1872), and Sellar's *Virgil* (Oxf. Clar. Press, 1877).

Virgil the Magician.—Just as the vulgar has ascribed to magic the forgotten origin of Stonehenge, so V.'s fame, outliving the poems that gave it birth, transformed the poet into a veritable Wizard of the South. That fame was firstly due to the veneration in which the *Æneid* was held by Pagan Rome as a faultless embodiment of the national faith and history, a veneration that found expression in the *Sortes Virgilianæ*, and next to Christians' interpretation of the Fourth Eclogue as a Messianic prophecy, which gave rise to countless allegorisings of the *Æneid's* self, and made Dante choose V. for his half-pagan, half-Christian guide. V., men said, had like the Magi beheld the Star, and from a magus to a magician the transition was easy. Thus myths grew up around the tomb at Naples, over which, according to the old Latin hymn, St. Paul had wept; and it is in Neapolitan folklore that Comparetti places the starting-point of V.'s magic fame, nearly all the earlier legends relating to talismans wrought by him for the good of Naples. John of Salisbury's *Polycraticon* (1156) speaks, it is true, merely of V.'s making a fly that destroyed all other flies, but a little later Konrad of Querfurt declares how he himself had seen the model of Naples enclosed by V. in a bottle, to guard the city as a Palladium from all its enemies, his statue of an archer whose arrow pointed at Vesuvius restrained eruptions, and similar marvels dear to the writer who in Southern Italy discovered Olympus, Parnassus, and Hippocrene. Further accretions—*e.g.*, of the brazen head, the magic garden, and the basket trick—often derived from Eastern sources, are found in *De Natura Rerum* of Neckam, Cœur-de-Lion's foster-brother, in Wolfram von Eschenbach's *Parcival* (1203-15), in Gervase of Tilbury's *Otia Imperialia* (*circa* 1211), in the *Image du Monde* (1245), a French encyclopædic poem, in the *Dolopathos* version of the *Seven Wise Masters* (q. v.), in the *Gesta Romanorum* (q. v.), and in a multitude of works by Italian, French, German, English, even Icelandic writers. With the revival of V.'s literary reputation the legend naturally waned, and its latest, scarce recognisable appearance, is in a Spanish romance of the middle of the 16th c. Paracelsus, indeed, alludes to it, and Evelyn saw at Paris a magic mirror ascribed to V., whose art is even to-day invoked in Italian love songs. See Zappert, *V.'s Fortleben im Mittelalter* (Vien. 1851); Genthe, *Leben und Fortleben des P. Virgilius Maro als Dichter und Zauberer* (Leip. 1857); and especially D. Comparetti, *Virgilio nel Medio Evo* (2 vols. Legh. 1872; Ger. trans. Leip. 1875), reviewed in the *Edinburgh* (July 1875).

Vir'gin Islands is the name given to an extensive group of small islands in the West Indies, lying between 18° 5' and 18° 50' N. lat., 64° 10' and 65° 40' W. long., exclusive of Santa Cruz, 50 miles to the S., which, though politically united with the V. I., is geographically distinct. The length of the entire group is about 100 miles, and its breadth 20 miles, but St. Thomas, the largest island, has an area of only 30 sq. miles, and most of them are exceedingly small. The character of the soil varies considerably in different islands, but in all it is fairly fertile; maize, sugar, indigo, and cotton being cultivated, while the castor-oil plant, the tamarind, the aloe, and the mahogany flourish wild in the woods. The surface is rocky and uneven, but the highest point, Sago Hill in Tortola, is only 1650 feet above the sea. Politically, the islands are divided between Great Britain, Denmark, and Spain; Tortola and Virgin Gorda or Spanish Town (said to be corrupted from Penniston) being the most important of those under British rule, St. Thomas, St. John, and Santa Cruz of those belonging to Denmark, while the largest of the Spanish Islands—Culebra—has an area of only 10 sq. miles, and a population of about 300. The British Islands are under the governor of St. Kitts, the Spanish are dependencies of Puerto Rico, and the Danish governor has his seat at Christianstadt, the capital of Santa Cruz. This island, 24 miles by 8 in size, is much more prosperous than any of the V. I. properly so called, possessing three good roads and two very respectable towns. The language generally spoken in it is English, which prevails over the whole group, with the exception of St. Thomas and John, which, having been originally colonised from Holland, retain the Dutch language. Pop. of the British V. I. (1871) 6651; of the Danish (1878) 37,600; of the Spanish, about 300. The V. I. were discovered by Columbus on his second voyage in 1494. In the 17th c. they became a favourite resort of buccaneers, after whose expulsion they changed hands frequently up to 1815, when their present political position was adjusted.

Vir'ginal, a keyed musical instrument which preceded the harpsichord. It derived its name probably from being used to accompany hymns to the Virgin, not from the fact of Queen Elizabeth's having been a skilful performer upon it, as has been erroneously supposed, the name being older than her time. The V. was in form like a desk of wood without legs, and was usually placed on a stand or table. It had a compass of from three to four octaves, one metal string being given to each of the notes, which were produced by the action of jacks of quill, whalebone, or leather.

Virgin'ia, one of the Middle Atlantic States of the American Union, bounded E. and S.E. by the Atlantic Ocean, S. by North Carolina and Tennesse, W. by Kentucky, and N.W. by West Virginia. Area, 38,348 sq. miles; pop. (1870) 1,225,163 (512,841 coloured). V. divides itself into the following six natural sections:—(1) *Tidewater V.*, the alluvial plain in the E. part of the State, lying along Chesapeake Bay, and extending W. as far as Richmond, nowhere more than 100 feet above the sea; (2) *Middle V.*, a triangular undulating plain, stretching W. from Richmond to the base of South-West Mountain, having an average elevation of 400 feet; (3) *Piedmont*, including both slopes of South-West Mountain and an undulating plain stretching to the base of the Blue Mountains; (4) *Blue Ridge*, a narrow belt parallel with the preceding, including both slopes of the Blue Ridge Mountains, the summits of which range from 2500 to 3000 feet in height; (5) *The Valley of V.*, a broad belt of undulating country from 1200 to 1600 feet above sea-level, of great fertility, and sheltered by the parallel chains of the Blue Mountains on the E., and the Kittatinny or Endless Mountains on the W.; (6) *Appalachia*, a region covered by the long parallel ridges of the Kittatinny Mountains and the intervening trough-like valleys. Of the rivers of V., the Kanawha or New River, empties into the Ohio directly; the Holston and Clinch, affluents of the Tennessee; and the Louisa, Russell, and Tug Fork affluents of the Big Sandy. Into Chesapeake Bay fall the Potomac (q. v.), the Rappahannock (q. v.), the Piankatank, the York (q. v.), and the James (q. v.). The principal geological formations in V. are the Pliocene, Miocene, and Eocene, the last irrupted occasionally by Triassic sandstone or Azoic rocks. Middle V. is Eozoic, while the Blue Ridge is a transition region. The rocks of the Valley are limestones, rich in mineral products. In the S.W. are thick seams of richly bituminous coal, covering 1000 sq. miles. Characteristic of V. are its numerous caves, rock-pillars, and natural bridges. Coal, gypsum, rock-salt, marble, lead, zinc, and plumbago are abundant, and gold is found in small quantities. Sulphurous and chalybeate mineral springs are numerous. The mean annual temperature varies from 60°-64° in the S.E., to 48°-52° in the Valley and Appalachia. In 1874 the chief crops were Indian corn, 19,082,000 bushels; wheat, 5,672,000; rye, 460,000; oats, 4,587,000; barley, 6300;

buckwheat, 40,000; potatoes, 1,068,000; tobacco, 35,000,000 lbs.; hay, 166,400 tons. In the same year the live stock was valued at $21,562,808, and consisted of 220,909 horses, mules, and asses, 567,289 cattle, 362,627 sheep and goats, and 571,779 swine. The principal manufactured articles are:—tobacco, flour-mill products, iron, lumber, cotton goods, and machinery. At the beginning of 1879 there were 1665 miles of completed railway within the State. The total imports for the year ending June 30, 1875, amounted to $487,082, and the exports to $8,189,327. The State capital is Richmond (q. v.). V. received its name from Queen Elizabeth in 1585, on the return of the expeditions despatched by Sir Walter Raleigh (q. v.). In 1606 South V. was granted to the 'London Company' by a patent, and on May 13, 1607, the first colony was planted and named James Town. It would have perished prematurely but for the courage and prudence of Captain John Smith. The colonists were on the point of abandoning the country in 1610, when Lord Delaware, who had been appointed governor, arrived with supplies and reinforcements. From this time V. began to flourish as the demand for its tobacco became greater in England. In 1624-25 the V. Company was dissolved and the colony reverted to the Crown. In 1619 V. obtained a colonial legislature, and in 1670 her aristocratic and conservative landowners limited the right of voting to freeholders and householders, while the Church of England was established by law, and persecuting laws passed against 'Nonconformists, Quakers, and Anabaptists.' Hostilities with the Indians and continual quarrels with the governors bring the history of V. down to 1754, when the war with the French commenced, in which Colonel Washington commanded the Virginian militia. V. opposed the levying of taxes by the mother country, and in 1765 adopted resolutions denying the right of England to impose them. In May 1776 she adopted a State Constitution, and entered with enthusiasm into the war. She led the way in summoning the National Convention which framed the Constitution of the United States, and kept her pre-eminence for thirty years. At the outbreak of the Civil War, by 88 to 55 votes at the State Convention of February 13, 1861, V. decided in favour of Secession. This was ratified in a plebiscite by a majority of 94,000 votes. The western counties opposed it, and accordingly the separate State of West V. was constituted in October of the same year. V. was occupied by hostile armies throughout the whole war.

Virgin'ia, West, one of the central states of the American Union, formed from Virginia in 1863, bounded S. and E. by Virginia, N. by Maryland and Pennsylvania, and on the W. separated from Ohio by the Ohio River, and from Kentucky by the Big Sandy River. Area, 23,000 sq. miles; pop. (1870) 442,014 (17,980 coloured). The most irregular in form of all the States, it includes a part of the Appalachian Valley, the western slope of the Appalachian range, and a portion of the upper valley of the Ohio. Its N.E. counties are drained by the Potomac, and its feeders, the Shenandoah and Opequan Creek. To the Potomac river system belongs a series of mountain-ridges sloping to the N.E., and separated by narrow and fertile valleys. W. of these extends in a narrow belt S.W. to the Big Sandy River the 'Mountain Region,' forming the western ridges of the Appalachian chain. Its highest summits are Panther Knob (4000 feet) and Haystack Knob (3800 feet). The rocks consist of parallel folds of sandstone resting on shales and limestones, through which streams, forcing their way to the Monongahela and Cheat rivers, have formed cañons, many of which are 1000 feet deep. Westwards to the Ohio extends a wider tract, called the 'Hilly Region,' with 20 peaks from 2200 to 3700 feet high. It slopes to the Ohio, and is drained by the Fishing Creek, Middle Island Creek, the Little and the Great Kanawha, Guyandotte, and the Big Sandy, with its affluent the Tug Fork. The chief geological formations are Lower Silurian, Devonian, and Carboniferous, irrupted here and there by Permian rocks. Of the great Appalachian coal-field, 16,000 sq. miles belong to the State. Rich iron ores are abundant, and salt is abundantly procured from springs of unusual purity. Petroleum is produced from over 400 springs, and many mineral springs exist, several thermal, the highest having a temperature of 107° F. In 1870 there were being worked within the State 185 mines and quarries, employing 1527 hands, and producing annually coal and iron ores to the value of $2,538,531. The soil is unusually fertile in the valleys and on the gentler mountain-slopes, and the climate is healthy, the mean temperature being 52° F. Over 9,000,000 acres of land are still in the original forest. The trees and wild animals found are those common to the Appalachians (q. v.). The chief crops in 1874 were Indian corn, 8,803,000 bushels; wheat, 3,268,000; rye, 268,000; oats, 1,684,000; barley, 50,000; buckwheat, 62,000; potatoes, 782,000; tobacco, 1,690,000 lbs.; hay, 167,880 tons. In the same year the live stock was valued at $18,948,283, and consisted of 116,877 horses, mules, and asses, 361,900 cattle (of which 124,300 were milch cows), 539,200 sheep, and 310,600 swine. The principal articles were iron and iron articles, flour-mill products, lumber, salt, leather, and glass. At the beginning of 1879 V. had 600½ miles of railway. The State formed the W. and N.W. portion of Virginia (q. v.) previous to the War of Secession. The capital is Wheeling (q. v.).

Virgin'ia, Univer'sity of, was chartered in 1819 with a constitution prepared by Thomas Jefferson. It was opened in 1824, and had then among its professors George Long and Thomas Hewitt Key, afterwards well known in connection with the University of London. It is divided into 16 different schools, each under a separate professor, and it has no imperative curriculum. It is directly under State patronage, and receives annually a grant of $30,000. It has 11 competitive scholarships open to natives of any State, besides 40 agricultural scholarships, founded in 1869. Its library contains 36,000 vols. The number of professors in 1876-77 was 17, and of students 330.

Virgin'ian Cree'per. See VITACEÆ.

Virgin'ian Quail (*Ortyx Virginiana*), a species of Rasorial birds belonging to the family *Odontophorinæ*, and nearly allied to that of the partridges or *Perdicidæ*. In the genus *Ortyx* the edges of the beak are sinuous or wavy, and the wings have the third to the sixth quills longest. The outer toe is united to the inner at the base. The V. Q. is also named the V. 'Colin.' It attains a length of 8 or 10 inches, and is of a reddish-brown hue, mingled with grey and black above, and yellowish white below. The head and breast are reddish brown and the chin pure white. The voice is clear, and the note resembles the words 'bob-white'—a name often familiarly given to the bird. The V. Q. feeds mostly on grains and inhabits open grounds, but in winter it approaches the habitations of man. The eggs may number as many as twenty-four. The bird is trapped in great numbers in winter. Its flesh is highly esteemed.

Virgin's Bower. See CLEMATIS.

Virgula'ria, or **Sea-Rod**, a genus of *Cœlenterate* animals belonging to the order *Alcyonaria* and family *Pennatulidæ*. The V. are common round the British coasts. Each of these organisms consists of a colony of polypes, having a sclerobasic or axial coral. The tentacles are pinnate. *V. mirabilis* is a familiar species.

Viria'thus, the shepherd-leader of the Lusitanians, or ancient inhabitants of Portugal, in their struggle for independence against the Romans, was one of the survivors of his countrymen's massacre by Sulpicius Galba (B.C. 150). Thenceforward he carried on in Lusitania and Southern Hispania a successful guerilla warfare against a succession of Roman proconsuls, winning two pitched battles, and in 141 entrapping the army of Quintus Fabius Servilianus in a mountain pass. Unconditional surrender was followed by alliance and a promise of independence; but within a twelvemonth Servilius Cæpio, the next proconsul, again took the field, and bribing some Lusitanian envoys, procured the assassination of V. (439), with whose death the conflict was virtually ended.

Vi'rus (Lat. 'a poisonous fluid') is a term used in medicine to designate the *materies morbi* of Zymotic Diseases (q. v.). It more specially designates those peculiar poisonous matters which can reproduce themselves under favouring conditions to an endless degree. The poison of the cobra is a specific V., which, when introduced into the human system, acts as a most virulent poison; but the poison is not multiplied within the human subject, and one person affected by the poison cannot communicate the disease to another. In like manner, morbid products from decaying vegetables under certain conditions of heat and moisture may possibly originate the V. of

malarial fever, but the V. is not propagated within the human organism, or, at all events, never in such a form as to render it capable of producing the same disease in others. By some the V. of the contagious or infectious diseases is supposed to be a *contagium vivum seu animatum*, the theory being that the V. consists of living beings or low organisms. Such views have been advocated by Kircher, Lancisi, Vallisneri, Reaumur, Linné, Henle, Roberts, and others; and although the theory of a *contagium vivum* is not as yet complete, the discussion of it is the most important which has ever engaged the attention of medical men. The most prominent characteristic of each specific V. is that it can reproduce itself within the human organism, and to an unlimited extent, each V. preserving its own specificness. Experience and observation tend to confirm the hypothesis that each specific disease breeds true, though, in the course of a thousand years, it is possible that changes within certain limits may take place, as is the case in animals and plants. The natural conclusion follows that diseases of this class do not originate spontaneously, but are propagated each from its own kind, though some contend that they do originate, even in our own day, spontaneously or autochthonously. Another remarkable peculiarity belonging to many, but not to all, diseases propagated by a specific V., is that a single attack of the disease successfully surmounted produces absolute or relative immunity for a certain length of time, or even for the remainder of life. See GERM THEORY OF DISEASE and ZYMOTIC DISEASES.

Viscon'ti (that is *Vice-comites*, or viscounts), a family famous in the history of Northern Italy, descended, according to their own account, from Desiderius, king of the Lombards. A certain Heribrand, or Eriprand, of the name is mentioned in 1037 at the siege of Milan; his son Otto became 'viscount' of the archbishopric of Milan about 1075; and a second Otto, grandson of the first, ascended the archiepiscopal throne in 1263. Archbishop Otto left the government of Milan to his nephew Matteo, who held the rank of imperial vicar of the city; but Matteo was excommunicated by Pope John XXII., whose claims on the archbishopric he had persistently resisted, and died about three months later, in 1322. Galeazzo, his son and successor, had a short and troubled reign, terminated by his death in 1329, and it was reserved for Azzo, Galeazzo's eldest son, to raise the reputation of the family higher than it had yet stood by his wise and merciful government of Milan, his successful wars, and his liberal patronage of the arts of peace. The grateful inhabitants to the number of 3000 put on mourning for his death, which took place August 1339. As Azzo died without children, his two uncles, Giovanni and Lucchino were now invested with the government —the former acting as bishop, and the latter as temporal sovereign. On the death of Lucchino (1349), who had been vicious and tyrannical, the bishop succeeded to his authority, and before he died in 1354 he had increased his dominion by the purchase of Bologna and the acceptance of the lordship of Genoa. Of the three nephews of Giovanni one died in 1355, and the V. possessions were divided between Barnabo and Galeazzo, of whom the former is mainly memorable for his contest with Pope Urban V., while the latter united the culture of a Mæcenas with the cruelty of a Dionysius, being equally famous as the patron of Petrarch and the deviser of a system of torture (Galeazzo's lent). On Galeazzo's death, his son Gian-Galeazzo began his remarkable career by getting rid of his uncle Barnabo and his sons. By a consummate policy, supported and carried out by the ablest diplomatists and warriors of the time, he gradually succeeded in extending his authority over the whole of Lombardy, and in making his influence felt not only throughout Italy, but in other parts of Europe. From the Emperor Wenceslaus he purchased the title of Duke of Milan in 1395, and the crown of Italy seemed almost within his grasp when he died, December 3, 1402. He had solidified his dominions into a state with a centralised administration, and, in the words of Professor Villari, deserves to rank as the first of modern as opposed to mediæval princes. To literati and artists he had been a bounteous patron, and two of the noblest buildings in Lombardy—the cathedral of Milan and the Certosa of Pavia—belong to his reign. Unfortunately his sons were unworthy of his fame. Giovanni Maria, who kept a pack of dogs for the purpose of tearing his personal enemies to pieces, was stabbed in 1412; and when Filippo Maria died in 1447 he left behind him the memory of little more than duping of men and waging of wars. He was succeeded by Francesco Sforza, his ablest soldier and subtlest enemy, who had married his daughter Bianca. See Lilla, *Familie Celebri Italiane*; Verri, *Storia di Milano*; and Villari, *Niccolò Macchiavelli and his Times* (Lond. 1878).

Viscon'ti, Ennio Quirino, a celebrated Italian archæologist, was born at Rome, November 1, 1751. A translation at the age of thirteen of the *Hecuba* of Euripides into Italian verse (Rome 1765) was a striking proof of the precocity of his scholarship. He was successively librarian in the Vatican (1771), Conservator of the Capitoline Museum (1784), and Minister of the Interior during the French period in Rome. In Paris, whither he fled in 1799, he was appointed Administrator of the Museum of Antiquities in the Louvre, and Professor of Archæology. He died February 7, 1818. His chief works are the continuation of *Museo Pio-Clementino* (Rome 1782-1807, 7 vols.), begun by his father, **Giambattista Antonio V.** (born 1712, died September 2, 1784), *Iconographie grecque* (Par. 1808, 3 vols.), and *Iconographie romaine* (Par. 1818-20, 3 vols.). Collections of his miscellaneous works were published at Milan (12 vols. 1818-22, and 3 vols. 1827-30). His brother, **Filippo Aureliano V.** (died 1831), was the author of *Museo Chiaramonti* (Rome 1808), in continuation of the *Museo Pio-Clementino*, and his son, **Louis Tullius Joachim V.** (born 1791—died December 1, 1853), is remembered as the designer of the tomb of Napoleon I. in *Les Invalides*, and of numerous public monuments and fountains throughout Paris. See Zannoni's *Elogio* of E. Q. V. in Florentine *Antologia*, No. xviii.

Vi'scount (Lat. *vice*, 'instead of,' and *comes*, 'count'), originally a designation of the sheriff of a county (an earl's vicegerent), was, in England, first bestowed upon John, Baron Beaumont, by Henry VI., in 1440, as an hereditary title, ranking fourth in the order of the British peerage. Viscounts, of whom there are now 67, received from James I. the privilege of wearing coronets, with a row of 12, 14, or 16 pearls, set on a circle of gold, while the mantle has two and a half ermine doublings.

Vis'cum. See MISTLETOE.

Vise (Old Eng. *vice*, *vys*; Fr. *vis*, 'a screw,' *Escalier à vis*, 'a winding stair'), a staircase winding round a perpendicular pillar called a *newel* (Nor. Fr. *nowel*). The steps are each formed of a single stone, and one end forms part of and is supported by the newel, while the other end is inserted into the wall.

Vish'ni-Volotchok', a town of Russia, government of Tver, on the Zna and the canal joining that river to the Tverza, 218 miles S.E. of St. Petersburg by rail. It is the central point of the V. system of canals, which includes 76 lakes and 106 larger and smaller rivers; and through the Tverza, an affluent of the Volga on the one hand, and the Msta, the Volchov and Lake Ladoga on the other, it connects the Caspian and the Baltic. The chief industry of V. is cotton-spinning. Pop. (1875) 17,400.

Vishnu' ('the encompasser or penetrator of the universe' according to Sanskrit commentators, from the root *vish*, 'to pervade'), the second god in the Hindu trinity, appears in the early Vedas as the manifestation of the Sun. In the later mythology, as represented by the Puranas, he becomes the supreme god, whose Avatars or incarnations (lit. descents) are necessary to restore order in the world. Of these Avatars 10 are generally enumerated, the last being yet to come. Some have evidently a cosmical explanation, but others may be thought to have a basis of historical fact. In the first five, V. appeared in the shape of various animals, the most popular representations being the fish, the tortoise, and the boar. His later Avatars were in the human form of the national heroes or demigods, Ram and Krishna, by which names he is commonly worshipped. Among his innumerable other titles may be mentioned Juggernauth, Narayan, and Parasuram. His wife is Sri or Lakshmi, the goddess of fortune. His adventures are described in the ancient epic of the Ramayana, and in the more modern poem of Jayadeva; and his worship, as opposed to that of his rival Siva, is inculcated in certain of the Puranas, chiefly the V. Purana, which has been translated with notes by Professor H. H. Wilson (Works, vol. vi. Lond. 1864). See Lassen's *Indische Alterthumskunde* (2d ed. Leip. 1866); Dr. Muir's *Original Sanskrit Texts*, vols. i. and iv. (Lond. 1858, 1863); and Monier Williams' *Hinduism* (Lond. 1877). Six principal sects of V.-

worshippers are enumerated at the present day. See also VAISHNAVS.

Vis'ible Speech, the system of expressing speech-sounds by written symbols, invented by Mr. Melville Bell during the years 1849–64. Its fundamental principle is, says its author, 'that all relations of sound are symbolised by relations of form, each organ and each mode of organic action having its appropriate symbol, and all sounds of the same nature produced at different parts of the mouth (such as *t* and *d*, *b* and *p*) being represented by a single symbol turned in a direction corresponding to the organic position.' The shapes of these symbols not being founded on any existing alphabet, the system here can only be illustrated, in the absence of the peculiar fount, by two that bear an accidental likeness to our current letters—O, symbolising that the throat is open, and C, that part of the mouth is contracted; and it is this creation of a novel type that, for reasons given under PHONETIC SPELLING, will probably always hinder the general adoption of the system. Among the advantages claimed for V. S. by Mr. Bell are its power of representing the exact sounds of foreign languages (even Zulu clicks), and the facilities offered by it towards teaching the illiterate and blind to read, and the deaf and dumb to speak. But though the first at least of these claims has been established by rigid tests, and is admitted by Mr. A. J. Ellis and other eminent phonologists, the system has not, as its inventor hoped, been taken up by Government, and so for want of oral demonstration, which only could make it popular, remains enshrined in his costly *V. S.: The Science of Universal Alphabetics* (Lond. 1867).

Vis'igoths. See GOTHS.

Vi'sion, in regard to the psychological and metaphysical questions to which it gives rise, is connected with the most abstruse questions in philosophy. These questions take their rise from an analysis of the testimony of consciousness on the subject, which proves that V. is to a great extent a *mental process*, and not (as the uneducated believe) a mere physical act. The theory has been ably elaborated by Berkeley, and has 'on the whole kept its ground as the acknowledged modern theory of V. amid the proverbial fluctuations of thought on such subjects.' It has been frequently quoted as 'the solitary example of a discovery in metaphysics.' Its main outlines are as follows. What we really see is only coloured points, and what we think we see we really infer from these. These coloured points, moreover, are presented to us in a plane, and therefore we cannot see distance—that is, we cannot see space. Space means 'room to move in.' We learn its existence by moving about, and when we say a thing is half-a-mile away, we mean that we would require to go through so much movement (with accompanying sensation) before we could reach it. Thus distance, magnitude, and relative situation between existing objects (all of which of course imply space of three dimensions), are all inferred, or (to use Berkeley's term) suggested by what we see, but are not themselves seen. Some of the signs that suggest distance are—A. Near distance. (1) Organic sensation in the eye; (2) degree of confusion in visible objects; (3) the organic sensation of straining. B. Far distance. (1) Number of intervening objects; (2) faintness of visual impression, &c. Were we without the power of motion, and did we open our eyes for the first time, we would only see coloured points; and then if we recovered the power of motion, we would gradually build up for ourselves that external world that we now know through V. As the things seen are the signs of what is not seen, so V. is a language by which (such is the ultimate form of Berkeley's philosophy) God speaks to us. The whole world, when properly understood, is the Divine language of its Creator. See Berkeley, *New Theory of V.*, together with supplementary dissertations and full quotations of authorities in the first volume of Fraser's edition (4 vols. Oxf. 1871). For the physics and physiology of V., see EYE; PERSPECTIVE; STEREOSCOPE; also COLOUR-BLINDNESS; HALLUCINATIONS; OPTICAL ILLUSIONS; and SQUINT or STRABISMUS.

Vis'on, a genus of *Carnivorous* quadrupeds included in the *Mustelidæ* or weasel family. Of this genus the Mink (*V. lutreola*) is the most familiar example. It inhabits N. Europe and N. America, attains a length of a foot and a half or rather less, and is of a brown colour, marked with white on the chin and jaws. The V. swims with great ease, the feet being slightly webbed. The fur is very valuable.

Vis'tula (Pol. *Wisla*; Ger. *Weichsel*), the largest river that flows into the Baltic, rises in Austrian Schlesien, on the N. slopes of the Bieskiden, and is formed by the union of the Black, the White, and the Little Vistulas (Biala, Molinka, and Czorna). It flows N. to the village of V., where it forms a waterfall 190 feet in height, then through a rocky valley to the town of Schwarzwasser, where it leaves the mountain-land. It next separates Prussian Schlesien from Austrian Schlesien and Galicia, and after receiving the Przemza, flows N.E., passing Cracow, and separating Galicia from Poland as far as Sandomir, where it receives the San, and turns N.N.W., then W., across the great plain of Poland, passing Warsaw, Nowo Georgiewsk, and Plock, and receiving the Pilica and Bug. Near Thorn it enters Prussia, and continues a N.W. course until it receives the Brahe below Bromberg, when it turns sharply N.N.E. At Montau, near Marienwerder, it divides into two branches, the smaller of which, called the Nogat, discharges into the Frische Haff, while the larger or western branch, after flowing 40 miles further, again divides at Fürstenwerder into two branches, the smaller or eastern falling into the Frische Haff, and the main branch turning W. and falling into the Baltic at Weichselmünde, 3 miles N. of Danzig. The total length of the V. is 694 miles.

Vita'ceæ, or **Ampelid'eæ**, is a small natural order of polypetalous dicotyledons, consisting of climbing plants with alternate simple or compound leaves; a small calyx; petals valvate in bud; stamens opposite the petals; fruit a berry with one or a few hard seeds. Besides the great genus *Vitis* (see VINE), which now includes the genera *Cissus* and *Ampelopsis*, the order comprises the small genus *Pterisanthes*, and the somewhat anomalous genus *Leea*. The Virginian Creeper (*Ampelopsis hederacea*), a rapid-growing creeper, native of the United States, is often planted to cover walls, to which it attaches by sucker-like discs terminating the tendrils. Its leaves turn red in autumn, when the plant presents a very striking appearance.

Vi'tal Statis'tics are statistics that relate to human life, such as the rate of births, deaths, and marriages, the increase of population, the average duration of life, and the health of the community. The compilation of such statistics is of great social importance. The sanitary reformer is guided as to the causes of disease in towns and districts, the physician is assisted to a knowledge of the effect of diseases upon individuals, and the ages at which they are most fatal, the actuary is enabled to make his calculations of risks dependent upon life, and the economist learns the laws of population and the lessons to be derived from them.

Complete registration of births, deaths, and marriages is necessary in order to obtain full data regarding the population of any country. In the United Kingdom very elaborate records of these events have been kept since the year 1837, but although every year shows a diminution in the number unrecorded, there are still considerable omissions in registration, particularly among the poor, owing to the neglect of clergymen, physicians, and other parties to give the required notice. The annual reports of the Registrar-General, however, are full of important information, and are the most valuable treasuries for the student of V. S. To the 39th Annual Report published in 1878 we are indebted for the following figures:—The increase of the population of this country since 1837 has averaged 192·873 souls, while 202·868 of a surplus have emigrated. While the average of births has been 1·039·987, the average of deaths has only amounted to 644·214. The natural increase of the population arising from the excess of births over deaths in England and Wales alone in the year 1876 was 377·653, while the loss to the population by excess of emigration over immigration was estimated at 38·065. In the period from 1837 to 1876 the economic value of the population has been increased by sanitary measures and judicious legislation. Municipalities have vied with each other in hygienic improvements resulting in a diminished rate of mortality among children, and from zymotic diseases. Thus in 1848–49 the cholera epidemic in England and Wales was fatal to 53,000 people, and the slighter epidemics of 1854 and 1866 show how this plague is under the control of science. The mean lifetime or average duration of life of an individual is, according to the English Life Table, compiled by Dr. Farr from the Government returns, 40·86 years. It is by

the Healthy Life Table compiled from the returns from healthy districts 49·0 years, or an increase of nearly one-fourth, which should be attainable in every well-organised State.

Marriages.—201,874 marriages were solemnised in England and Wales in 1876, being at the rate of 16·7 to every 1000 of the population, or ·1 less than the mean of the previous ten years, probably accounted for by depression in trade and a bad harvest. It is important for the solution of many social problems that the precise age at marriage of both parties should be in every case recorded, and there are still many shortcomings in this matter. The mean age of marriage of the ages ascertained in England in 1876 was 28 years for men, and 25·8 years for women, or dividing the marriages into first and subsequent marriages it was 25·7 years for bachelors, 24·4 years for spinsters, 43·1 years for widowers, and 39·5 years for widows. The mean age for men in the case of first marriage thus exceeded that for women by one year and $\frac{7}{10}$ths. There seems an increasing tendency to early marriage. In the period 1841–45, 4·38 per cent. of the males and 13·33 per cent. of the females who married were under age. In 1876 this percentage had increased to 8·25 for males and 21·99 for females. The marriage-rate in Scotland during 1876 was 15·1 per 1000 of the population. The figures for Ireland are incomplete and unreliable.

Ages at Marriage.—Actuaries have frequently questions submitted to them involving the risk of birth of issue to presently unmarried persons usually of good social position, to determine which statistics of ages at marriage are required. In Mr. Day's paper on 'Statistics of Marriage among Families of the Peerage,' published in No. 48 of the *Journal of the Institute of Actuaries*, the combined results of 3666 cases are published. The marriages of the aristocracy are fewer before thirty than those of the general population, about thirty they are equal, and for the remainder of life they are in excess. Mr. T. B. Sprague laid a paper before the Institute of Actuaries, 31st March 1879, on the 'Construction of a Combined Marriage and Mortality Table.' The probability of a peer marrying in a year is 0·01 at twenty, ·073 at twenty-five, ·074 at thirty, ·045 at forty, and ·011 at fifty. Of 100'000 peerage bachelors entering at fifteen there are 87·015 survivors at thirty, of whom 45·266 are unmarried, and 41·749 married, and at sixty there are 58·724 survivors, of whom 10·346 are unmarried and 48·378 married. According to the V. S. of the City of Philadelphia for 13 years, the probability of a female marrying before age twenty is 1 to 5 of all the probabilities she will ever marry, while at twenty-five two-thirds, and at thirty six-sevenths of the probabilities are lost. Statistics would seem to prove that married men as a rule are longer lived than bachelors; but this is misleading, as the general body of men are in good health at marriage, and a large proportion of men remain bachelors on account of physical weakness. Marriage, in fact, acts in the same way as selection does in life-assurance, and the effect of the selection wears off gradually; at the age of forty-five the mortality among married men being as great as that among bachelors. Crime is least rife among married people, and most common among those who have never married.

Births.—887,968 births were registered in England in 1876, being at the rate of 36·6 per 1000 of the population, the highest birth-rate on record, and 1·2 per 1000 above the average of the previous ten years. As might be expected, the mining and manufacturing counties show a greater birth-rate than the agricultural counties—thus Durham had a birth-rate of 45·2 per 1000, while that of Dorset gives only 28·5 per 1000. The illegitimate births numbered 41·594, being 4·7 per cent. of the total as compared with 5·5, the average of the previous ten years. The birth-rate in Scotland was 35·9 per 1000, in Ireland 26·4 per 1000.

Deaths.—In 1876, 510,315 deaths were registered in England, being 21·0 per 1000 of the population, a lower rate than any in the preceding twenty years. The rate in the Urban Registration Districts was 22·8, and in the Rural Registration Districts 18·6. The mean of the twenty-nine years 1847–75 was 22·5 for the whole country, 24·9 in urban districts, and 19·8 in rural districts. There were, in 1876, 108 deaths of males to every 100 deaths of females, the average being 104 to 100. The death-rate was less at every year of life than in 1875, probably on account of favourable atmospheric influences. The county with the highest rate of mortality was Lancashire (26·1 per 1000), that with the lowest rate the extra metropolitan portion of Surrey (16·2 per 1000). The proportional number of deaths of infants under one year of age was 146 for every 1000 births. In the large towns the proportion ranged from 142 in Portsmouth and 157 in London to 208 in Liverpool. The death-rate of children under five years was 63 per 1000 in England, ranging in the large towns from 69 in Norwich and 73 in London to 113 in Salford. The death-rate in Scotland in 1876 was the same as that in England, 21 per 1000.

The following table shows the mean annual mortality per 1000 in England and Wales since 1847:—

	England and Wales.	Urban Dists.	Rural Dists.
Mean of 4 years 1847–50	23.4	26.9	20.6
„ 5 „ 1851–55	22.7	25.5	20 1
„ 5 „ 1856–60	21.8	23.8	19.7
„ 5 „ 1861–65	22.6	24.7	20.0
„ 5 „ 1866–70	22.4	24 8	19 4
„ 5 „ 1871–75	22.0	24.0	19 3
Mean of 29 years 1847–75	22.5	24.9	19.8

The mortality in the British army in 1876 was 11·4 per 1000, or ·9 below the rate in the previous year. The mortality in the navy was 9·2 per 1000, or an increase of ·4 on the previous year. The mortality by drowning in the navy was 1·2 per 1000, and in the merchant service 11·4 per 1000. In the ten years 1866–75 these proportions were 2·4 and 13·6 respectively, figures surely forming a strong argument in favour of Mr. Plimsoll's legislation.

The following tables giving the V. S. of European states are taken from the Registrar-General's Report for 1878:—

TABLE A.

COUNTRIES.	Average Annual Rates per 1000 Population.											
	Marriages.				Births.				Deaths.			
	In 20 yrs. 1853–72	1874	1875	1876	In 20 yrs. 1853–72	1874	1875	1876	In 20 yrs. 1853–72	1874	1875	1876
England & Wales	16.9	17.1	16.8	16.7	34 8	36.2	35.5	36.6	22 4	22.3	22.8	21.0
Denmark .	15 9	16 4	16.9	17.0	31 6	30.8	31.8	32.5	20 3	19 9	21 0	20.0
Sweden . .	14.1	14.5	14.0	14 1	32.0	30.9	31.0	30.7	20.4	20.3	20.2	19 5
Austria . .	17.3	17.9	16.9	16.3	40.2	40.1	40.4	40 6	31.9	31.3	29.7	29.4
Hungary .	—	21.4	21.9	—	—	42.7	45.2	—	—	42.6	37.2	—
Ger. Empire	—	19.1	18.2	17.0	—	40.1	40.6	40.8	—	26.7	27 6	26.3
Prussia . .	17.1	19.4	18.0	17.1	37.7	40.1	40.5	40.5	27.2	25.9	26.4	25 4
Netherlands	15 9	16.6	16.6	16.4	34.3	36.1	36.3	36.8	25 7	22.6	25.4	23.3
France . .	15.9	16.6	16.4	15.8	26.1	26.2	26.0	26.3	24.4	21.4	23.1	22.7
Spain * . .	15 1	—	—	—	37.2	—	—	—	29.7	—	—	—
Italy * . .	15 4	15.2	16.8	16.2	37.4	34.9	37.7	39.0	30.2	30.3	30.7	28.7

TABLE B.—AVERAGE ANNUAL RATES OF BIRTHS, MARRIAGES, AND DEATHS IN TEN EUROPEAN STATES IN THE FIVE YEARS 1872–76.

Country.	Average Annual Birth-Rate.	Average Annual Marriage-Rate.	Difference between the Birth and Marriage Rate.	Average Annual Death-Rate.
Hungary † . .	42.8	21.9	20.9	46.8
Austria . . .	40.3	17.6	22 7	32.3
German Empire	40.1	19.0	21.1	27.6
Prussia . . .	40.1	19 1	21.0	27.0
Italy	37.1	15.8	21.3	30.1
Netherlands .	36.2	16.6	19.6	24.2
England & Wales	35.9	17.1	18.8	21.7
Denmark . . .	31.2	16.3	14.9	19 6
Sweden . . .	30.7	14.2	16.5	18 7
France . . .	26.3	17.2	9.1	22.5

Cholera was epidemic in Hungary in the years 1873 and 1874. In the former year it raised the death-rate as high as 65·1 per 1000. The health of the Italian population is in an unsatisfactory state, and demands the attention of scientific men, municipalities, and the national government, particularly as to deaths by fever and among children. The small birth-rate in France should be a matter of anxiety to our neighbours.

* The mean annual rates for Spain are for the ten years 1861–70; those for Italy are for the ten years 1863–72.

† For Hungary the rates are for the four years 1872–75.

The following figures, from a table published by the Board of Health of New York, show the death-rate per 1000 in 18 cities in Europe and America during the year 1873:—

United Kingdom.		Europe.		United States.	
London . . .	22·83	Stockholm . .	30·45	New York . .	29·08
Liverpool . .	25·81	Vienna . . .	35·28	Philadelphia .	19·64
Birmingham .	25·28	Dresden . .	34·82	St. Louis . .	19·44
Manchester .	28·29	Munich . . .	45·48	Brooklyn . .	23·89
Glasgow . .	28·92	Rome . . .	34·14	Boston . . .	28·46
Edinburgh . .	21·97	Venice . . .	36·26	New Orleans .	37·52

Statistics of death are frequently delusive as regards the health of population of towns on account of inaccuracies in the census and in the death returns. The medical skill concentrated in large cities also attracts hosts of invalids, and a large proportion of bad lives from all parts of the country flock to the workhouses, asylums, and hospitals of the towns. The statistics of some cities show the benefits obtained from improved sanitary arrangements, drainage, a good water supply, &c., in diminishing the number of deaths from fever, phthisis, and the infant mortality. Thus in New York the number of deaths of children under 5 years of age was 52·99 per cent. of the total deaths in 1867, and only 48·28 per cent. in 1875. It is usually the case that when an excessive mortality has occurred in a district from severe weather or other cause, this is followed by a low death-rate, the weaker portion of the population having been diminished, and a larger proportion of tenacious lives remaining. The supplementary Report of the Independent order of Oddfellows (Manchester Unity), published in 1872, contains valuable statistics as to the rates of mortality and sickness prevailing among the provident working classes of this country, and the effect of locality upon mortality. It contains an analysis and tables embracing 1·321·006 years of life, in rural, town, and city districts.

It is found that half the members entering at eighteen in the rural districts live to sixty-six years of age, in the town districts to sixty-four, and in the city to sixty-two, while half the miners and colliers live to sixty-three. Out of 100,000 living at age eighteen in rural districts, 8308 more persons are living on attaining the age of seventy than in city districts. The expectation of life among Oddfellows is as under:—

Age.	Rural Districts.	Town Districts.	City Districts.	Miners and Colliers.
20	43·0	41·4	40·1	41·3
30	35·5	34 1	32·8	34 3
40	28 3	26·8	25 8	27 3
50	21·2	19·9	19·0	20 2
60	14·8	13 4	13·2	13·9
70	9·2	8 3	8 3	8 8

The average sickness experienced by Oddfellows in periods of ten years was as follows in weeks and days:—

	Rural Districts.		Town Districts.		City Districts.		Miners & Colliers.	
	Wks.	Dys.	Wks.	Dys.	Wks.	Dys.	Wks.	Dys.
From 20 to 30	7	6	7	6	7	3	11	1
" 30 " 40	10	0	10	0	10	0	14	5
" 40 " 50	15	1	14	2	15	2	21	6
" 50 " 60	27	2	25	4	29	6	35	5
" 60 " 70	56	0	60	4	70	1	83	0
From 20 to 70	116	2	118	2	132	5	166	3

Although, as age advances, the human constitution has a greater tendency to decay and greater liability to sickness, still in advanced life there is a greater power of enduring sickness.

The principle is clearly established that there is a widely different rate of mortality among different classes and ranks of society. Dr. Guy, in the 9th volume of the *Journal of the Statistical Society*, gives the average age attained by persons who have survived their fifty-second year thus:—Clergy, 74·04; gentry, 74·00; medical men, 72·95; lawyers, 72·78; navy, 72·62; commercial men, 72·32; literary men, 72·10; aristocracy, 71·69; army, 71·58; fine arts, 71·15; painters, 70·96; chemists, 69·71; kings of England, 64·12. According to the observations of Casper of Berlin, 42 theologians, 35 commercial men, 29 lawyers, and 24 physicians, out of every 100 of the age forty-two, reached the age of seventy.

Mortality from Alcoholism.—The statistics of mortality among persons of intemperate habits, compiled in Mr. F. G. P. Neison's *Contributions to V. S.* (3d ed. Lond. 1857), show a rate three times in excess of that of the general population. The expectation of life of people of intemperate habits was as follows:—

Age.		Expectation.	Age.		Expectation.
20	...	15·6 years.	50	...	10·9 years.
30	...	13·8 "	60	...	8·9 "
40	...	11·6 "			

The average duration of life after the commencement of intemperate habits among beer-drinkers was 21·7 years, among spirit-drinkers 16·7 years, and among those who drunk both beer and spirits simultaneously 16·1 years. While there are no statistics to show that the lives of total abstainers are longer than those of the temperate population, it is certain that large classes who cannot be called drunkards suffer from alcoholism. Publicans, for example, show an excessive mortality, as the following comparison of the annual rate of mortality among clergymen and Protestant ministers, and among publicans, taken from the 35th Annual Report of the Registrar-General proves:—

Ages.	Clergymen.	Protestant Ministers.	Publicans.
25-35	4·65	5·83	14·49
35-45	6 28	7·30	20·44
45-55	13 24	9·33	28·59
55-65	22·70	24 60	43·03

Vitebsk', a government of Western Russia, surrounded by Pskov, Smolensk, Mohilev, Minsk, Vilna, Courland, and Livonia. Area 17,438 sq. miles; pop. 888,727. The surface is in general hilly; in the depressions are numerous marshes and more than 2500 lakes, of which the largest are Lubahn, Rasno, Nevel, Sebesh, and Osvea. The chief rivers are the Duna, Mesha, Kasplja, Ulla, Drissa, and Evst. The soil is far from fertile, and the harvests, except under the most favourable conditions, are insufficient for the wants of the population. The principal occupations are agriculture, cattle-rearing, hunting, and fishing, besides tanning, weaving, and the manufacture of brandy and tobacco. Flax, linseed, hides, building-timber, and fancy wares are exported.—**V.**, capital of the preceding, lies on both sides of the Duna, 79½ miles N.W. of Smolensk by rail. It has more than 30 churches (6 Roman Catholic), 2 synagogues, an old palace, a theatre, a gymnasium, and an hospital, manufactures of mead and leather, and an active transit trade. Pop. (1875) 31,180.

Vitell'ius Au'lus, Roman emperor, the son of Lucius V., the consul (34), was born A.D. 15. At that dark period of Roman history vice and not virtue was the passport to royal favour, and the son like the father was a master of the arts of servile cringing and abject flattery. To these he owed his rapid rise and his favour with Tiberius, Caius Caligula, Claudius, and Nero. On the death of Galba he was proclaimed emperor by the soldiers at Köln, January 2, 69 A.D., and having crushed his rival Otho he secured undisputed possession of Italy. Though undoubtedly a man of low character, he did not proceed to extreme measures against the adherents of his rival. His chief passion was sensual gluttony, and he spent enormous sums of money in eating and drinking. Such a man was not likely to rule for long the troubled Roman world. Vespasianus (q. v.) revolted and was proclaimed emperor 1st July at Alexandria, and Antonius Primus declared for the new emperor and hastened into Italy at the head of a powerful force. He defeated the generals of V. twice and entered Rome on the 21st or 22d December 69. The fallen emperor was seized, dragged with every mark of ignominy through the streets, and murdered. See Tacitus, *Hist.* 2, 3; Suetonius, *V.*, and Tillemont's *Histoire des Empereurs*, vol. i.

Vitell'us, or **Yolk**, the name given to a part of the eggs or ova of animals. It varies in form and size in different eggs, some being 'large-yolked,' and others 'small-yolked.' The hen lays a large-yolked egg, the embryo being developed from a mere speck on the surface, named the *cicatricula* or tread.

The name *vitellin* was formerly given to the essential substance of which the V. was believed to consist, but this substance has been shown to be merely a form of albumen and casein, and not a special product of organic chemistry. The V. consists of highly-concentrated protoplasmic or albuminous matter, along with mineral substances, and it contains the nutritive matter from which the early tissues of the embryo are formed. In many respects the egg-yolk resembles milk in its nature.

Viter'bo, a town of Italy, province of Rome, 42½ miles N.W. of the city of Rome. It lies to the N. of the Ciminian forest, and is still surrounded by six fortifications erected by the Lombards. Of its 17 churches, the chief are the cathedral of St. Lorenzo, founded in the 12th c., and the much-venerated church of St. Rosa, containing the mummy of a saint. In the former, an Englishman, Pope Hadrian IV., made the Emperor Friedrich I. hold his stirrup in token of homage. Other interesting buildings are the bishop's palace, the Palazzo Publico, with a museum, and the Palazzo Vescovile, where between 1261 and 1281 six papal elections took place. V. used to be called 'the city of beautiful fountains and beautiful maidens.' Of the former the finest are the Fontana Grande (1206), and another in the court of the Palazzo Publico. There are some manufactures of leather, paper, playing-cards, lucifer-matches, soap, &c. In the neighbourhood are the Bulicame sulphur-springs, and 10 miles to the W. the great Etruscan cemetery city of Castel d'Asso. Pop. (1874) 16,326.

Vi'tex, a genus of trees or shrubs belonging to *Verbenaceæ*, scattered over the tropical regions of both hemispheres, a few reaching as far N. as the Mediterranean. The chaste tree (*V. Agnus castus*) derives its name from a supposed efficiency in banishing impure thoughts, for which reason it was used in Greece during the sacred rites of Ceres. The plants of this genus are aromatic, and the fruit of many has acrid properties. In India, *V. negundo* and *V. trifolia* are employed in native medicines as a bitter tonic. *V. altissima* is an important timber tree of S. India and Ceylon.

Vi'tious Intromis'sion, in Scotch law. See INTROMISSION.

Vito'ria, a town of Spain, province of Alava, near the Zadorra, 80½ miles S.W. of San Sebastian by rail. It stands on a hill, and consists of an old town (Villa Susa) and a new town—the former close, dirty, and irregular, the latter more widely and better built. The new town contains also fine promenades or alamedas, and a very large square (the Plaza Nuova) surrounded by an arcade. V. has 5 churches, including a Gothic cathedral. It manufactures steel, iron, leather, crockery, candles, &c., and has also a trade in corn and wine. Pop. 15,600. V. is memorable as the scene of a brilliant victory gained by Wellington and the Spaniards over the French under Joseph Buonaparte and Marshal Jourdan, 21st June 1813. The result of this victory—the crowning triumph of the Peninsular War—was the expulsion of the French from Spain.

Vitré, a town of France, department of Ile-et-Vilaine, on the little river Vilaine, 170 miles W.S.W. of Paris by rail, has an old castle, several churches, and a library, and manufactures linen and woollen goods. Pop. (1872) 8752. In the immediate neighbourhood of V. is the Château des Rochers, the residence of Madame de Sévigné.

Vit'rified Forts are ancient hill-fortresses, the walls of which are formed of stone perfectly or partially fused. Ruins of such structures abound on the crests of Scottish hills, vestiges of them are reported to exist in Ireland, one is known in the commune of Cledrau in France, and others in Bohemia. Vitrification is now generally admitted to have been performed designedly by the builders of the forts; but to what age (undoubtedly remote) they belong, and the motive for vitrification, are points that have not been satisfactorily solved. See Maclagan, *Hill-Forts, &c. of Ancient Scotland* (Edin. 1875), *Proceedings of Antiq. Soc. of Scotland* (vol. viii.), and Jamieson, *On the V. F. of Scotland* (2d vol. *Trans. of the Royal Soc. of Literature*).

Vitrin'ga, Campe'gius, a Dutch theologian, born at Leeuwarden, May 16, 1659, and educated at Franeker and Leyden. In 1681 he was called to Franeker as professor of Oriental languages, becoming in 1683 professor of theology, in 1693 professor of Church History, and in 1698 declining a most urgent call to Utrecht, on which occasion the university authorities of Franeker signified their sense of the honour he had done them by raising his stipend to 2000 thalers. He died March 31, 1722. V.'s name is specially associated with the exposition of the prophet Isaiah, his *Commentarium* on whom (1714-20) was probably without a rival till the publication of Ewald's *Dichter des Alten Bundes*. Of his minor writings, that on the 'Synagogue'—two editions of which were published during his lifetime in 1685 and 1696—perhaps most deserves mention.

Vit'riol is a commercial name for Sulphuric Acid (q. v.), and for several salts which that acid forms. The term V. was in common use among the alchemists, and was derived from *vitrium*, 'glass,' on account of the glassy appearance and transparency of copperas or green V. (the sulphate of iron). From copperas the alchemists prepared a strong sulphuric acid by distillation, whence also the acid was termed the *oil of V.* In addition to these there is yet commercially known blue V., which is a sulphate of copper, and white V., the sulphate of zinc (*zinci sulphas* of the Pharmacopœia) much used in medicine.

Vitru'vius, Poll'io, a Roman architect of the age of Augustus, celebrated as the author of the only Latin treatise on architecture which has come down to modern times. Of the details of his life but little is known, and that little is due to incidental allusions in his own work. That he was fairly well acquainted with Greek and Latin literature; that he served as a military engineer in Africa; that he obtained the direct patronage of the reigning emperor (Augustus, according to the consent of modern scholars, but Titus, according to an older opinion advocated by Newton); and that he composed his treatise in his old age to guide the judgment of his patron in matters of architecture—are the principal facts that are thus preserved. The *De Architectura* was probably completed B.C. 14. Besides the subjects strictly included under the title, it treats of water and aqueducts, sundials and machines. The style is a very bad one: at times perplexingly diffuse, and again as perplexingly curt, with an almost total absence of true literary grace; but the matter is of great value as being largely an epitome of treatises by Greek architectural writers. The authoritative MSS. are the Harleian of the 9th c. and the Gordianus of the 11th. The *editio princeps* was by Sulpicius at Rome between 1484 and 1492; and of recent editions the most noteworthy are those by Rode (Berl. 1800, 2 vols.), Schneider's (Leip. 1807, &c., 3 vols.), Statico (Udine 1825-30, 4 vols.), Rose and Müller-Strübing (Leip. 1867). There are English translations by W. Newton (Lond. 1771-91, 2 vols., with plates), and Wilkins (Lond. 1813, 2 vols.); French translations by Martin (Par. 1547), Perrault (Par. 1673), Tardie and Caussin (Par. 1839), and Maufras (Par. 1847, &c.); and German by Rivium (Nur. 1548), Rode (Leip. 1796), and Reber (Stuttg. 1864, &c.). See Baldus, *De Verb. Vitr. Signif.* (Augsburg 1614); Haubold, *Exercit. Vitr.* (Leip. 1821); Lorentzen, *Observat. Crit. ad Vitr.* (Gotha 1858), and Rohl, *Index Vitruvianus* (Leip. 1876).

Vi'try-le-Fran'çois, a town of France, department of Marne, on the Marne, 22 miles S.E. of Chalons by rail. The principal church (founded in the 17th c.), the Hotel de Ville (occupying the site of an old convent), and a bronze statue of Royer-Collard (q. v.) are its chief architectural features. There is a college, a library with 12,000 vols., and a technical school. It manufactures hosiery, hats, cloth, sugar, and leather, and has considerable trade in coal and corn. Pop. (1876) 7580. V.-le-F. was founded in 1544 by François I., 2 miles from the site of Vitry-en-Perthois, which had been burned the year before.

Vitto'ria, a town of Sicily, province of Syracuse, 43 miles W.S.W. of the city of Syracuse, was named after the mother of its founder, Vittoria Colonna. It has considerable trade in silk and cattle, and bees are extensively reared in the vicinity, but it possesses otherwise but little interest. Pop. (1874) 16,543.

Vitto'rio Amade'o I., Duke of Savoy, was born at Turin, 8th May 1587, and succeeded his father, Carlo Emanuele I., in 1630. The duchy was then embroiled with France, but in the following year (September 15, 1631) peace was signed at Cherasco, the conditions being the surrender to France of Pinerolo and one or two other important fortresses in exchange for Montferrato and Alba—an exchange very much to the advantage of France. Four years of peace followed, in which

Spain and France intrigued against each other for the alliance of Savoy. At last V.-A. quarrelled definitely with Spain on the question of his right to the title of King of Cyprus, and threw himself into the arms of France. He was at once nominated commander-in-chief of the French troops in Italy (July 1635), and in the next year overran the duchies of Parma and Modena, and gained a victory over the Spaniards on the Ticino. The jealousy of the French general, the Maréchal de Créque, impeded his movements, but in the succeeding year (1637) he again defeated the Spaniards at Montebaldone. About a month afterwards he died at Vercelli (October 7th).—**V.-A. II.**, son of Carlo-Emanuele II., was born 14th May 1666. He succeeded to the throne at the age of nine, the government being carried on under the regency of his mother, who attempted, even after he had come to years of discretion, to retain the reins of government in her hands. In this she was thwarted by the energetic character of her son, who, after rejecting a Spanish alliance which she had planned for him, married (9th April 1684) Anne of Orleans, a niece of Louis XIV. Compelled to choose a side in the struggle between France and Austria, he at first joined his arms with those of France, but, disgusted by the imperious conduct of Louis, who treated him as a vassal and demanded the most humiliating concessions, he joined the league of Augsburg in 1690. His territories were at once overrun by the French, and he was defeated in campaign after campaign, until, dissatisfied with the conduct of his allies, he concluded an advantageous alliance with France, August 29, 1696, by which Nice, Savoy, Pinerolo, and Villafranca were restored to him, along with 4,000,000 francs of indemnity. At the beginning of the war of the Spanish Succession he remained faithful to France, but, again enraged by the proceedings of Louis, he went over to the Austrian side in 1702. At first it seemed as if the French would become masters of his whole territory, but the failure of the siege of Turin by La Feuillade was a severe check to them, and he ultimately succeeded, with the aid of Prince Eugene, in driving them over the frontier (1706), and in the succeeding year he invaded the S. of France, but failed to take Toulon, and in fact accomplished little or nothing. Soon afterwards he followed the example of England in deserting the Austrian alliance, and by the treaty of Utrecht (January 11, 1713) he was confirmed in the possession of Savoy and Nice, and obtained in addition the island of Sicily, with the title of king. Spain did not, however, permit him to retain peaceful possession of this portion of her spoils, and he was forced to exchange Sicily for Sardinia. In 1720 he was formally recognised as king of Sardinia, and henceforth his reign was undisturbed by wars. He devoted himself with equal diligence and success to the amelioration of the condition of his subjects. He fostered agriculture and industry, especially the rearing of silkworms and the manufacture of silk; he encouraged education, placed the army and finances of his kingdom on an improved basis, and in 1723 promulgated an elaborate code of laws, known as the *Codex Victorianus*. Not a great general, though an intrepid soldier, he found in internal government and reform the true bias of his genius, and may be called in every sense the founder of the fortunes of his house and of his country. From some reason not adequately explained, he abdicated the throne, September 3, 1730, in favour of his son, Carlo Emanuele III., and retired into seclusion at Chambéry. In the following year he made two efforts to re-assume power, both of which were forcibly suppressed. He was held then in a sort of honourable confinement at Moncalieri, near Turin, until his death on the 30th of October 1732. See Ceratti, *Storia di V. A.* (Tur. 1856).—**V. A. III.**, son of Carlo Emanuele III. and grandson of the preceding, was born at Turin, June 26, 1726. He succeeded to the throne in 1773, and devoted himself to increasing and reforming the military establishments of the country, though at the same time he liberally promoted education and science within his dominions. Holding political theories of the most aristocratic type, and united by two alliances to the royal house of France, his dominions were crowded with *émigrés* from a very early period of the Revolution, and he prepared in 1792 to join the coalition and invade France. The tables were turned, however, by the French invasion of Italy, first under Scherer, and then under Bonaparte. His power was completely crushed, and he was compelled to sign a treaty (May 15, 1796) by which he gave up to France both Nice and Savoy. He survived his misfortunes barely six months, and died at Moncalieri, 16th October 1796, being succeeded by his son, Carlo Emanuele IV.

Vitto'rio Emanue'le I, King of Sardinia, second son of Vittorio-Amadeo III., was born at Turin, 24th July 1759. Under the title of Duke of Aosta he took part in the war of 1792-96 against the French. Succeeding to the throne on the abdication of his brother Carlo-Emanuele IV. (1802), he attempted to maintain a position in Rome and Southern Italy, but was forced to retreat to the island of Sardinia, where from 1806 to 1814 he maintained a state of mimic royalty. The events of 1814 restored him to his kingdom on the mainland, and by the end of 1815 he was master of the whole of Savoy, Nice, and Genoa. Failing, however, to appreciate the spirit of the times, he strove to re-establish absolute monarchy in its extremest form, commenced persecutions against the Jews and Waldenses, and rapidly alienated the affections of his subjects. Early in 1821, revolutionary movements began to make themselves felt, and on the 9th of March the revolution fairly broke out, and on the 13th, V. E., recoiling from the measures which would have been necessary for its repression, abdicated in favour of his younger brother, Carlo Felice. He died at Moncalieri, January 10, 1824.—**V.-E. II.**, King of Sardinia, and afterwards of Italy, was born at Turin, 14th March 1820. He was the son of Carlo Alberto, and bore, until his accession to the throne, the title of Duke of Savoy. He took an active part in the revolutionary movements of 1848, and in the campaign against Austria, until his father's abdication after the battle of Novara placed him upon the throne of Sardinia (March 23, 1849). His position was one of extreme difficulty, but he succeeded in proving that he possessed higher qualities than the mere personal bravery which he had evinced in the war. He concluded a peace with Austria, not so disadvantageous as the circumstances might have justified, and set himself to quell the disorderly factions of his state by a strict and conscientious adherence to the constitution granted by his father. Fortunately for him and Italy, his efforts were seconded by ministers of the highest order of political ability. Azeglio was the first head of the cabinet, but was succeeded in 1852 by Cavour (q. v.), who remained until his death the most valued adviser of the king. By its participation along with England and France in the Crimean War, Sardinia asserted its position among the nations of Europe; and when, in 1855, V.-E., accompanied by Cavour, visited the courts of Paris and London, he was everywhere received with distinction. Gradually the enthusiasm for Italian unity was growing and strengthening. The war of 1859, during which time V.-E. personally distinguished himself in the battles of Magenta and Solferino, placed Austrian Lombardy under his rule, though it lost him Nice and Savoy, which were ceded to France, while the Grand Duchy of Tuscany, which in 1859 had placed itself under his protection, was definitely added to his dominions in 1860. The same year saw a much more important acquisition, in the kingdom of Naples and Sicily, wrested from the Bourbons by the heroic enterprise of Garibaldi (q. v.). All Italy, except the Papal States and Venice, was now under one government, and on the 17th of March 1861 V.-E. received the title of 'King of Italy.' This unexpected success was followed by an equally unexpected loss in the death of Cavour, June 6, 1861. The ill-advised attempt of Garibaldi to add Rome to united Italy as he had added Naples, was repressed by the royal troops in the battle of Aspromonte (28th August 1862). In the spring of 1865 V.-E. made Florence his capital in place of Turin. In the next year war broke out between Prussia and Austria, and Italy cast in her lot with the former. Though defeated at Custozza by the Austrians, V.-E. refused to make a separate peace with Austria after the battle of Königgrätz, and procured by the treaty of Vienna (October 1866) the absolute cession of Venetia and entire expulsion of the Austrians from Italy. In December 1866 the French garrison evacuated Rome, but returned in 1867 when Garibaldi, at the head of his volunteers, again threatened the city. V.-E. incurred some unpopularity by his refusal to recognise and second the efforts of Garibaldi, who was entirely defeated by the combined French and Papal troops at Mentana (3d November 1867). The disasters of the great war of 1870, however, led to the final withdrawal of the French garrison, and the Pope was left without moral or material support. The Italian troops crossed the frontier of the Papal states early in September, and after a trifling conflict with the Papal Zouaves under General Kansler, entered Rome on the 20th September 1870. The temporal power of the Pope was thus destroyed, the unification of Italy completed, and Rome

made once more the capital of the Peninsula. On the 1st of July 1871 the government was formally transferred from Florence. The Quirinal became the royal residence, while the Vatican alone remained in the possession of Pius IX. (q. v.). From this culminating point of his career until his death, V.-E.'s reign was peaceful and undisturbed. In 1873 he visited the courts of Vienna and Berlin, and in 1875 received visits from the Emperor of Austria in Venice, and from the Emperor of Germany in Milan. He died at Rome, 9th January 1878, very shortly before the death of his life-long antagonist, Pope Pius IX. He was married in 1842 to the Archduchess Adelaide of Austria, by whom he had five children. The eldest son, Prince Humberto (born March 14, 1844), succeeded him; the second son, Prince Amadeo, Duke of Aosta, occupied the throne of Spain from 1870 to 1873. V.-E. and Cavour contributed in almost equal measure to the great work of Italian liberation and unification. A true patriot, and a wise, firm, and moderate ruler, V.-E., himself no contemptible statesman, appreciated and carried into action with admirable fidelity the profound statesmanship of his great adviser. The almost unvarying personal popularity of *Il Re Galantuomo* was of great effect, and he may be regarded altogether as one of those rare men who, though perhaps not possessed of the most brilliant or the most lofty qualities, seem born to suit their circumstances, and so to achieve the greatest possible measure of success. See a Life by Massari (2 vols. Mil. 1878), V. Bersegio, *Il Regno di Vittorio Emanuele II.* (vol. i. Tur. 1878), and A. Gallenga, *The Pope and the King* (Lond. 2 vols. 1879).

Vi'tus' Dance, Saint. See CHOREA.

Vivandière (Fr.), a female attendant on the regiments of Continental armies, who sells provisions and liquors. She wears a modified form of the regiment's uniform, and is usually a special favourite with the soldiers.

Viverr'a, a genus of Carnivorous animals, the type of the family *Viverridæ*, in which there are three premolar teeth on each side of the upper jaw, while four may be in each side of the lower jaw. In the genus V. itself the feet are five-toed, and the claws small and curved, the thumb-joint being small and raised. To this genus belong the civets, the rasse, &c.

Viv'ien de Saint Martin, Louis, one of the most learned and able representatives of geographical science in France, was born May 22, 1802, at Caen in Normandy, came to Paris when twelve years of age, and published a *Carte Électorale et Administrative* in 1823 and an *Atlas Universel* in 1825. He was one of the founders of the Société de Géographie (1822), constructed the first georama in Paris (1826), and became successively editor of the *Annales des Voyages* (1842-56), the *Athenæum Français* (1852, &c.), and the *L'Année Géographique* (1863-76). Of the separate works which bear witness to V.'s unflagging industry and steady devotion to his favourite science, it is enough to mention *Études de Géographie Ancienne et d'Éthnographie Asiatique* (1850-54), *Sur la Géogr. et les Populations prim. du N.-O. de l'Inde d'apres les Hymnes Védiques* (1860), *Le Nord de l'Afrique dans l'Antiquité Grecque et Romaine* (1863), *Hist. de la Géogr.* (1873), *Nouveau Dictionnaire Géogr. Univ.* (2 vols. 1877 *et seq.*), *Atlas Universel* in 110 maps (1877 *et seq.*), *Dictionnaire de Géogr. Historique* (1878, &c.). V. is one of the honorary presidents of the Société de Géographie, from which he has also received the great gold medal, a vice-president of the Société d Éthnologie, and a member of the Berlin Academy of Sciences.

Vivisec'tion, the art and practice of experimenting upon living animals for the purpose of physiological discovery and medical research. The act of V. is never practised for the mere purpose of acquiring manual dexterity in operating; such dexterity is acquired by the student from practice on the dead subject. The subject of V. has become one of the 'burning questions' of late years, and recent legislation has been enacted with the view of placing the practice under restriction. The effect of the late enactments chiefly lies in the direction of preventing unqualified persons from experimenting on the living subject, and providing for the licensing by the Home Secretary of all persons and places where V. is carried on. The laboratories are duly inspected by Government inspectors, and returns of experiments are required by the recent Act, which is limited to Vertebrate animals in its scope. To the question—Is 'V.' necessary for physiological research, and therefore for the due furtherance of the healing art? there can be but one and that an affirmative reply. The answer to the query—'Is V. justifiable—even if necessary?' will depend on the attitude taken up with regard to the relations of the lower animals to man and to human wants and requirements. It is obvious that the whole question of the legality and morality of V. turns upon our construction and definition of the right to inflict pain, and also upon our opinion of the nature and amount of pain inflicted. Man inflicts pain on lower animals (1) in his search after food; (2) in the pursuit of pleasure; (3) in his repression of animal-species which threaten to annoy him; and (4) for the purpose of physiological research. That pain is inflicted upon the animal world in very many and varied ways, and that pain and death form the natural heritage of lower as well as higher life, are plain facts. Amongst animals themselves, bloody war and torture are carried on in the struggle for existence which pervades creation. Popular opinion recognises that man even in the pursuit of pleasure may inflict pain and torture upon lower animals, although in the case of the sportsman's torture of hares, foxes, deer, pigeons, &c., there exists but the gratification of tastes which bear no relation to the aims set before the scientific investigator in V.—namely, the advance of science and the cure of disease. But the subject of V. must also be considered in relation to pain and its nature. The standard of an animal's sufferings is certainly not that of human pain. Yet in discussions on V. the idea is invariably taken for granted or even expressed that the pain endured by the experimentation must be equal to human suffering. But, so far as physiology teaches, there is no warrant for the belief that a brain and nervous organisation inferior to that of man is capable of feeling or thinking with human power. Pain, in short, is relative to the organisation of the animal, and exists (when judged by human standards) in a gradually declining proportion as we descend in the animal series.

To the question, is V. absolutely necessary for the furtherance of medical research? the physiologist will unhesitatingly reply in the affirmative. How, for example, can the cure of *diabetes* be successfully accomplished, save by experiments on living animals with the view of determining how glycogen is formed in the liver? What knowledge of the cure of this disease we do possess, is founded upon Claude Bernard's vivisectional researches on the latter subject; and the case of diabetes and its cure is but one of many which might be cited with the view of showing the impossibility of curing disease rationally and successfully without recourse to experimentation on living animals. Sir Charles Bell could never have discovered the functions of the posterior and anterior roots of the spinal nerves without the aid of V.; and the latter discovery has laid the foundation of all the knowledge we possess regarding the action of the nervous system. The physiologist of to-day has no need to resort to V. to demonstrate already known facts and truths which are accepted without question by all. In the class-room V. is as needless as in the laboratory it is necessary. The whole question, indeed, is one which may be well summed up in the words of Professor Michael Foster, who in arguing that if medical science is worth preserving, and if human life be therefore worth saving, V. is necessary to further both ends—'Take away from the art of medicine all that with which physiology has enriched it, and the surgeon or the physician would be little better than a mystery-man or a quack vendor of chance-gotten drugs. Take out of the present system of physiology all that has been gained by experiments on living animals, and the whole structure would collapse, leaving nothing but a few isolated facts of human experience.'

Vizag'apatam' (*Visakha-patta-nam*='the land of Visakha,' the Hindu Mars), the chief town of the district of the same name, in the Madras Presidency, British India, on the sea-coast, 380 miles N.E. of Madras; pop. (1871) 32,191. It stands at the head of a bay, on a small river, and carries on a large coasting trade. One of the points of the bay, called the Dolphin's Nose, rises 1500 feet above the sea. A British factory was settled here in the middle of the 17th c. There are special manufactures of cotton cloth, gold and silver embroidery, silver, ivory, and horn ornaments. The exports in 1874-75 were valued at £117,000, chiefly piece-goods, oil-seeds, and sugar; the imports at £50,000. The *district* of V. occupies the strip below the E. Ghauts S. of Ganjam and the wild hill country behind; area 18,344 sq. miles; pop. (1871) 2,159,199. The crops are rice, oil-seeds, sugar-cane, and tobacco. The hills rise to the height of 5000

feet. Sugar is extensively manufactured under European superintendence. This tract formed one of the N. Circars occupied by the British in 1767, and includes the semi-independent States of the Jeypur Agency (q. v.).

Vizeu, a town of Portugal, province of Beira, 50 miles N.N.E. of Coimbra. It is old, irregularly built on a hill, and contains a cathedral with fine paintings, also a college, hospital, and theatre. There are two large squares, in one of which a great market is held in September. Among many Roman and Moorish remains is a Roman camp, the *Cava de Viriatho*, where Jun. Brutus was defeated by Viriathus. Pop. 7000.

Vizianágram, a town in the district of Vizagapatam, Madras Presidency, British India, 35 miles N. of Vizagapatam, and 12 miles from the sea-coast; pop. (1871) 20,169. In the fort is the palace of the Rajah of V., a Rajput family which figures largely in the early history of the British in Madras. The present Rajah, who usually resides at Benares, is the most Anglicised of Indian princes, and well known for his charity and munificence. The challenge shield annually shot for by the Lords and Commons at Wimbledon is his gift. He is a K.C.S.I., and a member of the Viceroy's Council. His income is over £100,000 a year, and he pays a fixed revenue to Government of £50,000. He is hereditary warden of a celebrated shrine of Siva at Kotiphali on the Godavery river. The area of his estate is 431 sq. miles; pop. (1871) 203,476.

Vizier' (Arab. *wazîr*, 'he who bears a burden'), the title of a high political officer in Mohammedan states. It is said to have originated with the first Abasside Caliph in 750 A.D., and to have been introduced among the Ottoman Turks in the reign of their second sultan. Subsequently, the title of V. Azim or Grand V. was adopted for the prime minister at Constantinople, where the rank of ordinary V. has grown common. In 1877 the title of Grand V. was abolished, but has since been introduced. At the court of the Mogul Empire at Delhi V. was the highest office; and the title ultimately became hereditary in the dynasty that ruled in Oude as Nawaub V.

Vizzi'ni, a town in Sicily, province of Catania, 28 miles S.S.W. of the city of Catania, has handsome streets and several fine buildings, including a college, hospital, and library. Pop. (1871) 14,831.

Vlaar'dingen, a town of the Netherlands, province of S. Holland, on the New Maas, 8 miles W. of Rotterdam by rail. It has one Catholic and one Protestant church, the latter with fine sepulchral monuments. V. is the chief centre of the Dutch herring fishery, which in 1876 employed 57 vessels and 855 men, and has large docks, shipbuilding, and considerable trade. Pop. (1870) 8575.

Vladi'mir, a government of Russia, surrounded by Jaroslav, Kostroma, Nijni Novgorod, Riazan, Moscow, and Tver. Area 18,862 sq. miles; pop. (1870) 1,259,923. The surface consists of level and undulating plains, and the soil is fertile. About 32 per cent. is covered with pine-forests. The whole government is drained by the system of the Oka, which flows for 82 miles through V., and receives from the left the Kliasma, with its navigable tributary, the Tesa. The largest lake is Plechejevo, which receives the Trubesh, and sends the Great Nerl to the Volga. The principal crops raised are buckwheat, rye, oats, potatoes, pulse, flax, cherries, and onions. In industrial activity V. ranks next to Moscow and St. Petersburg. Its manufactures include paper, crystal, glass, chemicals, brandy, cotton, linen, and woollen fabrics, and metal wares, chiefly knives, chisels, locks, gimlets, and reaping-hooks. The forests yield timber, pitch, and tar. A special industry of V. is the manufacture of Icons, to the value of 1,200,000 roubles annually.—**V.**, capital of the preceding, on the Kliasma, 110 miles E.N.E. of Moscow by rail, has twenty-eight churches, two monasteries, handsome government buildings, &c., and manufactures of Icons. Pop. (1875) 16,422.

Vladi'mir I., Czar of Russia, commonly called **V. the Great**, or **Saint V.**, was the son of the Grand-Duke Sviatoplav by a woman of low condition, and great-grandson of Rurik. His father assigned to him the government of Novgorod, dividing the rest of the empire between his two legitimate sons, Jaropalk and Oleg. In 977 Jaropalk quarrelled with Oleg and killed him, and V. would probably have met the same fate had he not fled to the Varangians (q. v.). Two years later he returned with an army, overcame Jaropalk, and remained sole master of the empire, having his capital at Kiev. He now set himself both to extend and to consolidate his dominions, which were little better than a collection of tributary states, scarcely subject to any real control. He enlarged his boundaries from the Black Sea to the Baltic, and appears to have had an intention of welding his empire into a homogeneous mass through the agency of a common religion, in which he tried to combine the Slavonian and the Finnish superstitions. In 988, however, an event occurred which altered his schemes entirely. He had already five wives and almost a thousand concubines, but while besieging the Christian city of Cherson, in the Crimea, he conceived the idea of demanding the hand of Anna, the sister of the Byzantine Emperors Constantine and Basilios. Through the agency of this princess, known in history as Anna Romanovna, he was converted to Christianity. His subjects, who had already been prepared for Christianity by intercourse with the Greeks, followed his example. The Scriptures had already been translated into Slavonic by Cyrillus and Methodius, and Russia soon became a Christian country. V. was now as enthusiastic in his Christian virtues as he had formerly been in his heathen vices. He could scarcely be induced to sanction capital punishment, he exercised a lavish charity, built churches and monasteries, and promoted not only the Christianisation but also the civilisation of his subjects. He died at Beresyx in 1015 at a great age, and divided his empire among his twelve sons. The Russian Church has canonised him, and given him a rank equal to that of the Apostles, and the famous 'V. order' was founded in his honour by the Empress Catherine II. in 1782.—**V. II.**, called **Monomachus** after his maternal grandfather, the Emperor Constantine Monomachus, was born in 1052, and succeeded to the empire in 1113, in opposition to the ordinary Slavonic rules of inheritance. Though not free from some of the barbarisms of his age, he did much for Russia by the establishment and enforcement of just laws, and the consolidation of the internal affairs of the empire. He was married to Gida, daughter of King Harold of England, and his granddaughters married the kings of Norway and Denmark, so that the famous Valdemar of Denmark, probably so named in his honour, was his great-grandson. He died at Kiev, May 19, 1126, leaving behind him a long 'testament' full of instructions to his descendants, which presents a curious picture of contemporary manners and opinions.

Vliess'ingen. See FLUSHING.

Vode'na (Gr. *Bodena*), a town of Turkey, in Macedonia, 46 miles W.N.W. of Salonica, at the foot and on the summit of a rock over which an affluent of the Mavroneri (Karasmak) falls. It manufactures tobacco, and has some woollen and cotton spinning. Pop. 10,000. V. occupies the site of the ancient *Edessa*, the residence of the Macedonian kings before Philip.

Vo'gel, Eduard, an African traveller, was born at Krefeld, March 7, 1820. His father was Johann Karl Christoph V., afterwards director of the public school at Leipzig, and his sister is known in German literature as Elise Polko. Devoting himself to astronomy, V. studied at Leipzig and Berlin, and in 1851 became assistant to Hind in London; but in 1853 he was called to take command of an expedition from England intended to co-operate with Barth and Overweg in Central Africa. In January 1854 he reached Lake Chad, in December joined Barth near Zinder, and in 1855 pushed S. to Yacoba and the Benue. Before the close of the year he entered the kingdom of Wadai, where in the early part of 1856, probably on 8th February, he was brutally massacred near Abeshr. See his sister Elise Polko's *Erinnerungen an Einen Verschollenen* (Leip. 1863).

Voghe'ra, a town of Italy, province of Pavia, on the Staffora, 81 miles E. of Turin by rail. It was fortified by Giovanni Galeazzo Visconti, and an old castle still exists built by him towards the end of the 14th c. The church of St. Lorenzo, founded in the 11th c., and remodelled in 1600, is the only building of importance, but the town is handsome and well laid out. There are considerable manufactures, chiefly of cloth and hats. Pop. (1874) 15,500.

Vogler, George Joseph, usually called **Abt** (that is Abbot or Abbé) **V.**, a German composer, was born at Würzburg 15th June 1749. The Elector of Bavaria, Karl Theodor,

enabled him (1773) to prosecute his musical studies at Bologna, Padua, and Rome, and on his return to Germany he was appointed kapellmeister (1772) and court chaplain at Manheim (1775). After several years of travel in France, Spain, Greece, and Africa, he was for a short time kapellmeister at Stockholm, and then we find him in succession at Copenhagen, Altona, Berlin, Prague, and Vienna (1803-5). At Darmstadt, where he settled in 1807, he had Weber and Meyerbeer among his pupils; and he died there 6th May 1814. V. was a voluminous composer both of sacred and secular music, and he contributed to the critical literature of his art, but both his pieces and his books have passed into the background. In his own day, while some considered him a man of highest genius, others denounced him as a charlatan. Charlatan or genius, he has been immortalised in English literature by a powerful poem in Browning's *Dramatis Personæ*, in which he is represented as saddened by the irrevocable vanishing of all music, and then gladdened by the thought of an after life in which it will become eternally possible to recall or re-create.

Voice (Fr. *voix*, Lat. *vox*), the production of sound, as distinguished from *speech*, which is a further modification of V. to produce articulate sounds representing ideas. V. is produced in the *larynx*, or *organ of V.* situated at the top of the trachea or windpipe. The larynx is a gristly and elastic box or cavity, containing two elastic folds of mucous membrane—the so-called *vocal cords*. These cords are so attached to the cartilages of the larynx and to muscles that they may be stretched or relaxed, shortened or lengthened, and otherwise altered so as to produce changes in the sounds produced by their vibration. The chief cartilages of the larynx are the *thyroid cartilage*, covering the front of the organ, and the *cricoid cartilage*, a circular structure supporting the two *arytenoid cartilages*. The vocal cords are attached posteriorly to the base of the arytenoid cartilage, and to the back part of the thyroid; hence movements of these cartilages necessarily affect the cords; whilst the movements of the cricoid cartilage affecting the arytenoids which rest upon it, will also alter the position of the V.-producing structures. By aid of an instrument consisting of deftly-arranged mirrors, and named the *Laryngoscope* (q. v.), we are enabled to discover the mode of action of the vocal cords in the living subject. The observation of the larynx proves that the inferior vocal cords are the true organs of V.; the *false vocal cords* being the name given to the folds of mucous membrane placed above the true vocal cords already mentioned. The expired air passing over the edges of the cords throws them into vibration and produces the V. If the windpipe be opened below the larynx, the voice is destroyed, but returns when such an opening is closed; whilst if the opening be made above the *glottis* or entrance to the larynx, so that air still passes through the larynx, the V. is uninjured. So also, if the nerves supplying the vocal cords be injured, V. ceases. In the dead body V. may be produced by forcing a current of air through the larynx; and this occurs even after removal of the false vocal cords. In the production of V., those structures which aid in placing the vocal cords in a parallel position may perhaps be credited with the largest share of importance. The *glottis* or opening of the larynx in ordinary quiet breathing is triangular in shape, becoming, however, slightly narrower at each expiration. In taking a deep inspiration, the glottis dilates widely and becomes somewhat lozenge-shaped. When V. is produced, it narrows, and the edges of the arytenoid cartilages become opposed, the vocal cords being thus brought parallel with and closer to one another, whilst they are drawn tighter than before. The higher the note of V. produced the tenser are the cords drawn. Thus the range of V. depends very largely upon the power possessed of causing tension of the cords. By the laryngoscope, the vocal cords are seen to be brought forward, and are readily seen during the production of a high note; whilst they are depressed and overarched by the epiglottis when deep notes are produced. The hinder part of the aperture of the glottis does not appear to be concerned in the production of V.; a fact which shows that the arytenoid cartilages and their movements have no share in this function.

In the physiology of V. three kinds of notes are recognised: (1) those which possess one pitch, or nearly so, as in speaking; (2) the alternations of high and low pitch, witnessed in sounds of crying or in the howling of animals; (3) the true musical sounds, where the nature of each sound depends on the number of vibrations. The distinction between noise and musical sound depends on the definite vibrations of the latter and the indefinite vibrations of the former. The qualities of V. found in man number four—two recognised as the attributes of the male sex, *tenor* and *bass*, and two belonging to the female V., *soprano* and *contralto*. Primarily the difference between male and female voices consists in the fact that they begin and end at different notes in the musical scale. About an octave of difference thus exists—the lowest note of the female averaging an octave higher than the lowest of the male. About four octaves is the total range of male and female voices together. The bass V. is strongest in its low notes; the tenor extending higher than the bass, but the latter being most powerful in its low notes. What is technically named *timbre*, in reality constitutes the difference between the various voices, the expression having reference to the quality as well as to the compass of the notes of each. The different pitch of voices is due to the varying length of the vocal cords, those of men as compared with those of females being as three to two. The *timbre* is found to depend on the form and shape of the larynx, which is larger in men than in women, and possesses more extensive walls. Before *puberty* the voices of boys resemble those of women; and it is noteworthy that in eunuchs who have been castrated prior to puberty the V. remains in the boyish state. The vocal cords become longer after the period of puberty has been attained, while in old age the cartilages become ossified, and nervous power becomes deficient, these conditions producing the unsteady V. of aged persons. The production of *falsetto-notes* as distinguished from *chest-notes* appears to depend upon some obscure and ill-understood modification of the action of the vocal cords. Müller conceives that falsetto-notes are produced by the vibration of the inner borders only of the cords, while Diday and others attribute the production of these notes to vibrations of air passing through the aperture of the glottis. Among the subsidiary but in many ways important circumstances which aid in modifying the V., are the amount or degree of vibrations of the cords; the nature of the nervous control of these structures; the observance of the larynx, throat, and mouth-cavities; the freedom of respiration, &c. The mind also has an undoubted influence in the regulation of the V. An inability to distinguish notes or tunes naturally exists in many persons, and this mental condition naturally interferes with the culture of the V.

Voir'on, a town of France, department of Isère, on the Morge, 13½ miles N.W. of Grenoble by rail. It has extensive manufactures of iron and steel goods, cloth, paper, leather, &c. Pop. (1876) 11,064.

Voi'ture, Vincent, born at Amiens in 1598, studied at Paris, and by a copy of verses (1614) securing the patronage of Gaston d'Orléans, became comptroller of that prince's household. Through a fellow-student, the Comte d'Avaux, and his own gay wit, he gained an entrée to the choicest Parisian circles, notably to the Hôtel de Rambouillet (q. v.), of which he was looked on as the laughing, as Balzac its serious, philosopher; and in 1634 he was chosen one of the early members of the French Academy. Despatched to Tuscany (1638) to announce the dauphin's birth, he passed on to Rome, there to receive the membership of the Academia dei Umoriste; and on his return became the king's maître d'hôtel (1639), from this and from other appointments drawing a revenue of 18,000 livres. Gambling his only passion, he lived on gallant and frivolous to the last, dying in Paris, 26th May 1648. The rondeaux of V. are the best among their kind; of his sonnets one gave rise to the great literary feud of Jobelins and Uranistes; his *Lettres* (ed. by Roux, 1856) were regarded as models of the epistolary art. Yet somehow they all have lost their point; the charm and prettiness ascribed to them can no longer be seen, though it is allowed that modern French prose owes much of its present facility to V. See Ubicini's edition of V.'s *Œuvres* (2 vols. 1855), and Demogeot's *Tableau de la Littérature Française au XVIIe Siècle* (Par. 1859).

Volca'noes, or **Burn'ing Mount'ains**, are hills which from a vent or 'crater' eject smoke and flames, stones, or lava upon the surrounding country. The first sign of the appearance of a new volcano is said to be the opening of a rift or chasm in the earth, from which issue masses of steam or vapour accompanied by many loud explosions. Lava, or molten rock, then appears flowing over the margin of the chasm, and often also

discharged by a sudden outburst into the air, along with clouds of smoke and showers of stones and dust. The lava, according to Sir Charles Lyell, 'is forced up by the expansive power of entangled gaseous fluids, chiefly steam or aqueous vapour, exactly in the same manner as water is made to boil over the edge of a vessel when steam has been generated at the bottom by heat.' That portion which has been shot into the air, for the most part 'separates into fragments, and acquires a spongy texture by the sudden enlargement of the included gases, and this forms *scoriæ*, other portions being reduced to an impalpable powder or dust. The showering down of the various ejected materials round the orifice of eruption gives rise to a conical mound in which the successive envelopes of sand and scoriæ form layers, dipping on all sides from a central axis. In the meantime a hollow called a *crater* has been kept open in the middle of the mound by the continued passage upwards of steam and other gaseous fluids.' The crater usually exhibits a round orifice occupying the apex of the conical mountain, and has very generally one side higher than the other whenever a steady wind has directed the falling material towards one particular quarter. The great internal heat and exhaustion of the contained material frequently lead to the falling in of a crater, in which case there is produced a great trough or hollow, at the bottom of which is the new vent. Such hollows, often of vast size, are known by the Spanish name of Calderas.' An entirely new crater, appearing at a short distance from the old one, is also a not uncommon phenomenon.

From the crater the sides of the mountain slope regularly and gradually downward on all sides, and the dust and ashes and scoriæ of which they are formed soon decompose and weather into a rich and fertile soil, peculiarly adapted for the growth of the vine and certain other plants. Thus Santorini in the Ægean Sea is famous for its marvellous fertility, and for the wine and even cotton produced on it; and the grapes which grow upon the slopes of Mount Vesuvius produce the wine well known to travellers as 'Lachrymæ Christi,' or 'Tears of Christ.' It was declared by Leopold von Buch, and his statement was accepted by many other geologists, that lava rolling down the slopes of a mountain ere it consolidated invariably assumed a porous or vesicular structure, and only formed a dense and solid rock when deposited on a surface horizontal or nearly so. Accordingly, pushing this theory further, its upholders said, when they found a mountain flanked by strata of compact, nonporous lava, that those beds could not have been formed in such a situation, but must have been laid down at an angle not exceeding 4 or 5 degrees, and upheaved subsequently to their ultimate position. For mountains formed after this manner von Buch proposed the name of 'Elevation Craters,' and cited as a typical example the Isle of Palma, one of the Canary group, a great, inactive volcano, with a huge crater surrounded by sheer precipices 2000 feet in height. Sir Charles Lyell, however, who visited the island for the special purpose of examining into the grounds of this hypothesis, found no reason to suppose that the mountain had been formed in other than the usual manner.

The lava, besides being vomited forth from the mouth of the crater, also very frequently makes its escape by rifts or secondary openings in the mountain-side. Thus, during the great eruption of Hecla in 1783, an immense mass of molten lava burst from a great fissure, and formed a fiery river which flowed on for a distance of about 50 miles, and then divided into two branches, each of which pursued its way to the sea for a nearly similar distance. The greatest breadth attained by this huge torrent was 15 miles, and the extreme depth 100 feet. The fine dust or powdered scoriæ being shot up to a vast height in the atmosphere, may be carried by the wind to an enormous distance. The volcanic dust from Hecla has fallen on more than one occasion in the Orkney and Shetland Islands, notably in the eruption of 1845; and in 1835 the ashes from Cosequina are said to have been wafted to Jamaica, 700 miles away. Besides the solid matters which are ejected, such as stones, dust, and lava, sulphureous vapours, carbonic acid, and other gases are frequently exhaled. Dead animals and birds have been picked up on Vesuvius during eruptions, and the valley of the Upas Tree, in Java, owes its deadly effects, not to the tree itself, but to the noisome vapours which issue from an extinct volcanic crater, and prove destructive to every animal that ventures near.

Submarine V. are by no means of rare occurrence, though their eruptions seem to be as a rule of short duration. Voyagers have occasionally observed smoke arising from the sea, and shortly afterwards a new island begins to show itself above the level of the waves. The Canary Islands, and many of the scattered islands of the Pacific, owe their origin in this manner to submarine eruptions. An island, known as 'Grahame's Island,' thus appeared in 1831, in the Mediterranean, but the loose materials of which it was composed were soon disintegrated and washed away by the sea.

The suddenness with which volcanic manifestations take place is often very remarkable. The famous outburst of Vesuvius in 79 A.D., by which Pompeii, Herculaneum, and other cities were overwhelmed, took place, with very little warning, after a period of inactivity so long that the volcano had been looked upon as extinct. In the last century the hill near Naples known as Monte Nuovo was upheaved in a single night, and in 1759 a tract of country amounting to about 4 sq. miles was suddenly raised to a height of 5000 feet in the great plateau of Mexico. The most important European V. are Vesuvius, Etna, and Hecla. On the first of these there is a well-equipped observatory, in which Professor Palmieri resides, and takes constant observations, which cannot fail to increase our knowledge of the conditions of eruptions, and also probably to give timely warning of impending outbursts. The Lipari or Æolian Islands, off the Sicilian coast, known anciently as the Insulæ Vulcaniæ, and Santorini in the Archipelago, are also more or less active. The chief island in the former group, namely Stromboli, is called by our sailors the Lighthouse of the Mediterranean; by day, nothing but a column of smoke is seen ascending from it, but this at night has the appearance of a pillar of fire, being brightly illuminated by the reflected glow from within the crater. In the department of Auvergne, in Central France, are very numerous extinct volcanic mountains, the highest summits being Puy-de-Dome, Mont Dor, and Cantal, all of which have been inactive since the Miocene age. Jan Mayen is an isolated volcanic island situated in 70° N. lat.

In the S. American Continent numerous V. are found, from Tierra del Fuego northwards through the chain of the Andes, the principal centres being in Chili, Peru, and Quito. Central America has several large craters, such as Casiguina and Popocatepetl, while the Rocky Mountain ranges have, N. of Mexico, few active but many extinct and dormant V. Hence the chain of volcanic activity is continued through the Aleutian Islands to Kamschatka, where the chief volcano has the lengthy name of Klutchewskaja, and the series is prolonged down the whole length of the western coasts of the Pacific, by Japan, the Philippines, the Sunda Islands, and New Zealand. Among the isolated and oceanic V. we may enumerate Hawaii and the Marquesas in the Pacific, the Azores, Teneriffe, and the Cape Verd group in the Atlantic, Jebel Tarr or Mount Sinai on the Red Sea, and Mount Erebus in the Antarctic, in lat. 77° S. See Scrope, *V. and their Phenomena* (new ed. Lond. 1872); and Fuchs, *Vulkanen und Erdbeben* (Leip. 1875).

Vole (*Arvicola*), a genus of *Rodentia* (q. v.) belonging to the Rat and Mouse family (*Muridæ*). The voles differ from their more familiar neighbours by possessing curiously-folded molar teeth. The ears are rounded and short, and the tail is also short. The incisors, as in mice and rats, number 2 in each jaw, the premolars 2, and the molars 4. The best-known example of the V. is the Water V. (*A. amphibius*), popularly named the 'Water Rat.' Its average length is about 13 inches, the tail attaining a length of 3 or 4 inches. It breeds twice yearly, and produces from 4 to 5 young at a birth. The colour is a chestnut brown mixed with grey on the upper parts. The water V. feeds upon a variety of substances, chiefly vegetable, but that it devours fish is doubtful. The Campagnol or Short-tailed Field Mouse (*A. arvalis*) is a true V., which often swarms in immense multitudes in certain districts and destroys large quantities of grain and the young shoots of trees. An excessive production of voles occurred in the New Forest about 1813–14, when large numbers were captured in pits dug for their reception. The Campagnol is also named the Short-tailed Field Mouse to distinguish it from the 'Long-tailed' species, which is a true mouse. It also receives the name of 'Field V.' Its average length is 5 inches, and the colour a ruddy brown above and grey beneath.

Vol'ga (Tartar *Etil, Itil, Atel*, 'bountiful;' Slav. *Bolga* or *Vg* Finnish, *Rau*; the anc. *Rha* or *Darus*), the largest river of Europe, rises in the central Russian government of Tver, near

the Dwina, about 200 miles from the Gulf of Finland, flows S.E. through several small lakes, receiving the Selicharovka from Lake Seliger, then S.E. past Rsjev to Subzov, where it turns N.E., passing Tver and Rybinsk, then S.E. through the governments of Jaroslav, Kostroma, Nijni Novgorod, and Kasan, passing Nijni Novgorod and Kasan, and receiving from the right the Oka, and from the left the Mologa, Kostroma, Unsha, and Wetluga. At Kasan it turns S., receives from the left the great Kama and the Samara, and from the right the Sura, separates the governments of Simbirsk and Saratov from Samara, and passes the towns of Simbirsk, Samara, Sysran, Wolsk, and Saratov. At Sarepta it turns sharply to the S.E. and flows in that direction to the Caspian, which it enters by 8 principal and 200 smaller mouths, forming a delta 68 miles in breadth. Besides those named, about 100 smaller tributaries join this giant river, which with its affluents has a drainage area of 517,120 sq. miles, waters 22 governments, and measures from its source to its mouth 2290 sq. miles. Its breadth at Tver is 705 feet, at the mouth of the Mologa 1542 feet, above the influx of Kama 4920 feet, and opposite the mouth of the Kama nearly 5 miles. The course of the V. is very slow, its total fall is only 896 feet, and its channel is comparatively shallow, its greatest depth being 85 feet. The V. is free from ice for 200 days in the year, in Kostroma, Jaroslav, and Kasan for 152. Steamers ply regularly upon its waters between Tver and Nijni Novgorod, Kasan and Astrakhan; and from Nijni Novgorod by the Kama to Perm, by the Oka to Riazan, by the Ufa to Ufa, and by the Unsha to Ugor. The three great canal systems of Vishni-Volotchok, Tichvin, and the Marien canal, connecting the V. with St. Petersburg, and the canal of the Duke of Wurtemberg joining it with the Dwina, make an unbroken water-way between the Baltic and the Caspian Sea. A canal to join the V. with the Don, between Zarizyn at Katchalinsk, was projected by Peter the Great, but was never executed. Its purpose is now effected by the Zarizyn-Kalatsch Railway. The V. has extensive fisheries, chiefly of salmon and sturgeon. See Legrelle, *Le V.; Notes sur la Russie* (Par. 1877).

Volhyn'ia, a government of Western Russia, bounded N. by Grodno and Minsk, E. by Kiev, S. by Podolsk, W. by Austrian Galicia and the Polish governments, Lublin and Sjedlez. Area 27,738 sq. miles; pop. (1870) 1,719,890. The surface in the N. is uniformly flat and in some districts marshy; in the S. it is covered with offshoots from the Carpathians, the summits of which are 1200–1300 feet high. Many rivers rise among the hills in the S., among them the Turia, Styr, Goryn, and Teterev to the N., and the Sbrutch to the S. The rivers belong to the system of the Pripet and Teterev, affluents of the Dnieper, or to that of the Bug, which for 112 miles is the boundary between V. and Poland. The N. half of the government, known as *Polesje*, contains many small lakes. The largest unbroken swamp is that which stretches from the frontier of Grodno to the river Pripet, covering 386 square miles. The soil in the S. is exceptionally fertile, and yields abundant crops of corn, beet-root, tobacco, hops, pulse, and fruits. The chief manufactures are sugar, paper, leather, chemicals, glass, pottery, cloth, and metal wares. The principal exports are, corn to Odessa, Galicia, Poland, and through Pinsk to Prussia; cattle, hides, horn, and wool to Galicia and Poland; and timber, which is carried to the Vistula, and floated down to Warsaw and Danzig.

Voli'tion. See WILL.

Voll'ey, a simultaneous discharge of small-arms. A similar discharge of artillery is called a Salvo.

Vol'ney, Constantin François Chasseboeuf, Comte de, a French traveller, philosopher, and politician, was born 3d February 1757 at Craon in Anjou. He lost his mother at an early age, and was almost neglected by his father, who was a lawyer of some repute. He was educated at the colleges of Ancenis and Angers, where he highly distinguished himself, and at seventeen years of age went to Paris to continue his studies. His father, who had 'emancipated' him, or renounced his paternal authority, gave up to his own control the little inheritance of 1110 francs a year which he had from his mother, and made him exchange the name of Chasseboeuf, which was distasteful to him, for that of Boisgirais. He himself afterwards assumed the name of V. At first he devoted himself to medical studies, but soon turned his attention mainly to history. An essay, *Sur la Chronologie d'Hérodote*, which he published in 1781, threw open to him the philosophic salons of Paris, but in the same year he received another small inheritance of 6000 francs in all, which he determined to devote to travel in the East. After careful 'training' for the endurance of hardships and privations, he started on foot for Marseille in the end of 1782, carrying his little store of money in a belt on his person. He spent nearly three years in the East, seven months in a convent on the Lebanon studying Arabic, and the rest of the time travelling in Lower Egypt and Syria. On his return he published his *Voyage en Egypte et en Syrie* (Par. 1787), which achieved a great success, exhibiting as it did great powers of minute observation and philosophic reflection. His celebrity thus began just as the Revolution was breaking out. The Royal government had appointed him director of agriculture and commerce in Corsica, where he wished to try some agricultural experiments, but being elected to the States General by the province of Anjou, he gave up his post before he had even commenced his duties. On the dissolution of the National Assembly, however, he retired to Corsica, where he purchased an estate near Ajaccio, and began his experiments. Here he made the acquaintance of Bonaparte, and is said to have predicted his greatness. Driven from Corsica by Paoli's insurrection, he returned to France, and once more took part in political affairs. His attachment to the Girondin party very nearly cost him his head during the Reign of Terror. He was imprisoned for ten months, and would certainly have been executed but for the Revolution of Thermidor. The publication of the work by which his name is now principally remembered, *Les Ruines ou Meditations sur les Révolutions des Empires* (Geneva 1791), had meanwhile added to his fame, and he was appointed (1794) professor of history in the École Normale. On the breaking up of this institution a year later he went to America, where he got into a quarrel with Priestley, and also with the United States Government. On his return to France in 1798 he at first favoured the designs of Bonaparte, though he refused the Ministry of the Interior after the Brumaire Revolution. He became a member of the Senate, but soon went into opposition, as Bonaparte's despotic tendencies became more apparent, though in 1808 he accepted the title of Comte. On the Restoration V. was raised to the Chamber of Peers, where he maintained a position as a partisan of moderate liberty. His last work was a brochure on the occasion of the coronation of Louis XVIII. at Rheims, entitled *Histoire de Samuel, Inventeur du Sacre des Rois* (Par. 1819). He died at Paris, 25th April 1820. His principal works, in addition to those mentioned above, are his *Considerations sur la Guerre des Turco et de la Russie* (Lond. 1788), in which he predicted the French occupation of Egypt, *La Loi naturelle, ou Catéchisme du Citoyen Français* (Par. 1793), in which he attempted to establish an order of the universe on a purely theistic basis, *Leçons d'Histoire* (Par. 1799), *Tableau du Climat et du Sol des États-Unis d'Amérique* (Par. 1803), *Supplément à l'Hérodote de Larcher* (Par. 1808), *Simplification des Langues Orientales* (Par. 1759), *L'Alphabet Europée applique aux Langues Asiatiques* (Par. 1819), and *Discours sur l'Étude philosophique des Langues* (Par. 1820). He appears to have been among the first to recognise the importance of philology as a means to the study of ethnology and 'prehistoric history.' See Bossange's *Notice sur la Vie et les Écrits de V.* (Par. 1821), and Berger's *Études sur V.* (Par. 1852).

Vo'lo, a seaport of Turkey, in the vilayet of Janina, stands at the head of the Gulf of V., 37 miles S.E. of Larissa. A small place with a population of only some 3000 souls, it has an excellent harbour, which in 1874 was entered by 2417 vessels of 161,840 tons, the exports (cereals, silk, tobacco, oil, &c.) amounting to £997,699, the imports to £426,842. At V., during the late Thessalian insurrection, Mr. Ogle, the Athens correspondent of the *Times*, was murdered by Turkish irregulars, 2d April 1878.

Volog'da, a government of Great Russia, S. of Archangel and N. of Kostroma. Area, 155,498 sq. miles. Pop. (1875) 1,003,039; of whom 897,000 are Russians and 172,000 Syrjanians, a Finnish tribe. Its surface is mostly a vast plain, becoming hilly towards the S., and mountainous towards the E., where the Urals expand into a wild highland tract. Only in the S. of the government is agriculture possible. Most of the province lies in the great forest zone, and 87 per cent. of its surface is covered with pine woods. V. is drained chiefly

by the Dwina (q. v.) and its tributaries towards the White Sea; the Petchora flows through the N.E. part to the Arctic Ocean. Hunting and fishing are almost the only employments in the major part of this government. Salt, skins, and iron are exported. —**V.**, the capital of the government, on the V., a tributary of the Suchona, 281½ miles N. of Moscow by rail. It is an old wide town, largely built of wood, the residence of the governor and a bishop. It has 54 churches, a theological seminary, a gymnasium, and several monasteries. There are extensive manufactures of sailcloth, leather, soap, matches, linen-cloth, glass, white-lead, and jewellery. Pop. (1875) 17,233. V. was founded in the 12th c. During the 16th it was a great centre of trade with England, and many English settled here. Though less important now as a trade emporium, much merchandise still passes through the place to the White Sea ports.

Vol'sci, a people of ancient Latium, whose language proves them to have been a branch of the Umbro-Sabellian stem, and who, holding the Pontine Marshes, the valley of the Liris, and the Volscian Hills, extended from the sea-coast to the Samnite frontier. With Rome they seem from an early period to have waged constant wars, with one of which the legend of Coriolanus (q. v.) is associated, but Rome had entirely subdued them by 338 B.C., from which date they vanish as a separate race from history. See Corssen, *De Volscorum Lingua* (Naumb. 1858).

Volsk, or **Voljsk**, a town of Russia, government of Saratov, on the Volga, 80 miles N.E. of Saratov. It has 5 churches, a technical school, normal school, &c. There are large quays along the river, and trade in tallow and skins with St. Petersburg, in fruit with Nijni-Novgorod, and in corn with Astrakhan and Rybinsk, is carried on. A great market is held in autumn. Pop. (1875) 31,269.

Vol'ta, Alessan'dro, a famous natural philosopher, was born at Como, in N. Italy, 19th Feb. 1745. In 1774 he was appointed to the chair of natural philosophy in the University of Pavia, which he resigned in 1804, after making the electrical discoveries which laid the foundation of what is still known as *Voltaic electricity*. The nature of these discoveries is noticed under other articles; here we need only enumerate them, referring to the particular heading under which each is treated. In 1775 he invented the *electrophorus* (see ELECTROSTATIC INSTRUMENTS), the principle of whose action was first satisfactorily given by Dr. Ingenhouz (*Phil. Trans.* 1778), and in 1782 his researches led him to the construction of an electric condenser and an electrometer, or, more properly, an electroscope. The discoveries of Galvani, which that philosopher regarded as indicating the existence of animal electricity, were traced by V. to their true cause, thereby opening up a new field of scientific research (see *Electrokinetics* under ELECTRICITY, and VOLTAIC BATTERY). His last years were spent in his native town, where he died of fever, March 5, 1826. His collected works were published at Florence (3 vols. 1816). A statue of V. was unveiled at Pavia on April 28, 1878.

Volta'ic Batt'ery is any arrangement of different substances which in virtue of their electric relations and mutual chemical action are capable of generating electric currents. At the contiguous surfaces of any two different substances in contact, a difference of electric potential exists, which depends upon the surfaces in contact and the temperature at which the contact is made. In a circuit of simple conductors, such as metals, kept all at one and the same temperature, the sum of these differences taken all round is equal to zero—in other words, the contact forces balance, and there is no current possible. Where, however, one of the substances in circuit is an *electrolyte* or decomposable liquid, experiments show that the contact forces do not balance, that there is a resultant electromotive force to which the current is proportional. The energy of the current is derived from the chemical action which invariably accompanies the generation of currents. Thus, in the earliest form of V. B., namely, Volta's Pile, a single element consists of copper and zinc discs separated by a piece of moistened paper or cloth. When the circuit is completed by joining the copper and zinc with a wire, a current begins to flow, while simultaneously the zinc is oxidised, the water decomposed, and hydrogen given off at the copper surface. Heat is always evolved when oxide of zinc is formed; but, in the pile, part of this energy of combustion first appears as energy of an electric current, ultimately, of course, after a longer or shorter period, being transformed into its equivalence of heat. Electrolysis (q. v.) is thus the invariable accompaniment of voltaic action. Polarization, due to the accumulation of the products of decomposition upon the electrodes, is also a frequent accompaniment, and if not in some way prevented has the effect of diminishing the electromotive force of the cell. In Smee's battery, the one product, oxide of zinc, is dissolved in the dilute acid which forms the electrolyte, while the other, hydrogen gas, readily escapes from the surface of the finely-divided platinum which forms the positive pole. The double liquid cells are, however, the most constant in electromotive force, since the liquids at once dissolve the products which appear at the respective poles. Thus in Bunsen's cell, which consists of zinc and carbon electrodes immersed in dilute sulphuric and strong nitric acid respectively, the liquids being separated by a porous diaphragm so as to be in contact with mixing, the sulphate of zinc formed at the negative or zinc pole is retained in solution, and similarly with the nitric and nitrous oxides formed at the positive or carbon pole. The Grove cell differs from the Bunsen cell in having platinum instead of carbon for the positive pole. The most constant of all known cells is the Daniell. It consists of zinc and copper electrodes, immersed in semi-saturated sulphate of zinc and saturated sulphate of copper respectively. Sulphuric acid may be substituted for the sulphate of zinc. When the cell is working the zinc is eaten away to form sulphate of zinc, which dissolves, while at the same time copper separates out from the sulphate of copper, and is deposited in the copper pole. Neither pole then changes character, so that there is no tendency to polarization. See Wiedemann's *Galvanismus and Magnetismus*, and Cumming's *Theory of Electricity*.

Voltaire' (originally FRANÇOIS MARIE AROUET) was born at Paris, probably November 20, 1694. Hardly expected to survive, he was 'ondoyé' or privately baptized. But he grew up a bright and precocious boy, and at the College Louis le Grand, where he was placed when about ten years of age, he delighted his Jesuit teachers by displays of unusual ability in the literary exercises of the schools. At seventeen V. declared he wished to be nothing but a man of letters, and while for some time he nominally attended the legal classes, his head was full of odes and epics and tragedies. His prudent father, to remove him from the temptations of Paris, sent him to Holland as secretary to the Marquis de Châteauneuf, but the marquis soon sent V. back again, guilty of having fallen hotly in love with a Mademoiselle Dunoyer (1714). At length in 1716 an unexpected interruption occurred in his career. Accused of being the author of a satire on the Duc d'Orleans, he was for a time banished from Paris; and not long after his return from exile at Sully-sur-Noir, another piece, *Les j'ai vu*, really written by Lebrun, being ascribed to him, the Duc made him a prisoner in the Bastille (16th May 1717–10th April 1718). Towards the close of 1718 his *Œdipe* was brought on the stage and obtained a brilliant success; and though he was again banished to Sully in 1719, he continued for the next six or seven years to extend his influence both in society and in letters. He laid the foundations of a considerable fortune, he was on intimate terms with dukes and princes, and he began to be in favour at court. After a second imprisonment in the Bastille he was set at liberty within a few weeks on condition that he left the country for a time, and embarked for England in the end of August 1726. He had already become acquainted with Lord Bolingbroke in France, and during the three years of his English residence (1726–29) he found congenial associates in Locke, Shaftesbury, Toland, and Clarke. Rapidly acquiring a free command of the English language, he absorbed the influences then at work in our literature, and in all his after writings the traces of his indebtedness are abundant. Shortly after his return to France he printed anonymously at Rouen the *Lettres Philosophiques*, in which he sought to enlighten his countrymen in regard to the English and their methods of thought and life; but his praise of the foreign principles and procedure was regarded by the government as an audacious attack on itself, the book was burned by the public executioner, and the author was obliged to seek safety from arrest in Lorraine (May 1734). In 1733 he had met with the Marquise du Châtelet, a lady of unusual intellectual ability and scientific attainments. With her he now found an asylum, and till her death their lives continued to flow in a common, if not always a peaceful, channel.

V. in his time had formed attachments and friendships with many women, but none of them except this were of permanent moment in his career. In the Marquise du Châtelet he found a vigorous and co-operative sympathy with his work as a man of letters. When she died in 1749, though her death in childbed was the result of an intrigue with a younger admirer, V.'s grief was excessive. Meanwhile his authority in literature had been rapidly extending; he had received a seat in the French Academy (1746), and for years he had been the correspondent and guide of the young Friedrich II. of Prussia. An invitation to Berlin, frequently repeated since 1737, he at length accepted in 1750, and nothing could have been more flattering than the welcome he received from his patron and pupil. But it was not long before the mutual felicitations grew less enthusiastic: a thousand little disagreements disturbed the intercourse of the two monarchs. The story becomes a pitiable succession of squabbles and recrimination. V. wished to be trusted with Friedrich's political schemes, and Friedrich wisely trusted him only with his verses. There was an academy at Berlin, of which Friedrich was naturally proud, and which V. as naturally turned into ridicule. Against Maupertuis, one of the Academicians, V. wrote his *Diatribe du Docteur Akakia*, one of the most brilliant and bitter of his satires, and the diatribe was by Friedrich's orders burned by the hangman. At length V. bade a wrathful adieu to Berlin (26th March 1753), but to his intense chagrin and exasperation he was arrested at Frankfurt on the Main by Friedrich's agent Freytag, and obliged to deliver up certain royal manuscripts and other mementos of his Berlin residence. The hostility of the clerical party in France was by this time thoroughly aroused against him, and at length in 1755 he found it prudent to seek safety in Switzerland, finally settling at Ferney or Fernex, a little French village on the Genevese frontiers. For the next seventeen or eighteen years he remained the patriarch of Ferney and the cynosure of intellectual Europe. His niece, Madame Dénis, kept house for him. Visitors and guests were abundant; staid burgers from neighbouring Geneva, savants and princes from far and near. Yet no old man was ever so laborious. V. was no recluse from the world's doings, but could make his power felt far for justice and right, as the incident of *Calas* (q. v.) proves. At length in 1778 V. was persuaded to return to Paris. Welcomed by universal gratulation of nobles and people, fêted and flattered till he felt as if he were 'being choked with roses,' the old man found his strength give way under the excitement and effort, and in the night of May 30-31 he breathed his last. V.'s literary activity was simply marvellous. His correspondence alone was labour for a lifetime. He was master of a style of lithe and sinewy structure in which grace and strength are the common outcome of the most accurate adjustment and interplay of parts. He is never feeble, never bombastic; always forcible, never forced. To the drama, the department in which he gained his first great success, V. frequently returned; the author of *Œdipe* became the author of *Mariamne* (1723), *Zaire* (1732), *Alzire* (1736), *L'Enfant Prodigue* (1736), *Mahomet* (1741), *Mérope* (1743), *Le Café ou l'Écossaise*, and a score of other pieces, tragic and comic. In this department of French literature he comes immediately after Corneille and Racine. While he was still in the first flush of his dramatic success he solicited Minerva in a more ambitious task; French literature had dramas of immortal strain, but every epic as it rose had withered and was forgotten. The *Henriade* (first published without the author's authority in 1723, and afterwards at London in 1726) was accepted by his contemporaries as an achievement worthy to rank the poet with Homer and Virgil; but though it is still remembered and read, it is relegated to a very secondary position. His notorious *Pucelle* is really a more powerful poem, for the great master of mockery was here in his element, though he was unfortunate enough to throw despite on a name which has since risen into the highest heaven of a nation's admiration. If we turn to V.'s prose writings we find the same variety of form; histories, romances, tales, dialogues, essays, pamphlets, satires. His tales, such as *Candide ou l'Optimiste*, *Zadig*, and *L'Homme aux quarante Écus*, are from a literary point of view among the happiest of his efforts. In his hands history became no longer a book of kings or a chronicle of wars, but a study of laws, arts, manners, and movements of thought. With the partial exception of *Charles XII.* (1731), this is true of all his historical works of importance—*Siècle de Louis XIV.* (1752), *Essai sur les Mœurs* (1757), *Histoire de Russe* (1759-63), *Précis du Siècle de Louis XV.* (1768), and *Histoire du Parlement de Paris*. They are based on laborious investigations, and as far as possible on what we now call original research. In the eyes of his sterner critics V. is only a great *persifleur*; but through all his writings, from tragedy to jeu d'esprit, one increasing purpose runs, to emancipate the human mind from the ruthless domination of superstition. He was not an atheist. He believed as dogmatically in God as he disbelieved in Moses and Christ. But superstition he identified with the church, and the church with Christianity; and against this triune abomination he fought ceaselessly at once with secret and with open war. He had no great constructive ability, and in room of the vast theologico-metaphysical structure which he undermined, he was content to put up with very flimsy wicker-work. On the other hand, he battled nobly for justice and freedom. Against religious persecution his whole soul rose in impassioned revolt. Though he grievously misunderstood and indeed hardly recognised many of the noblest aspirations and ideals of the race, to the great cause of humanity he was not untrue, and the world, whether it thank him or not, owes him no small debt of gratitude. It would be vain to attempt a list of the editions of his *œuvres*. The most noted are Beaumarchais and Condorcet's (70 vols. Kehl 1784-89), Beuchot's (70 vols. Par. 1829-34), and Avenel's (1867-73). His *Œuvres Inédites* appeared in 1862. V. was not only voluminous himself but he has been the cause of others being voluminous also. For details, see Quérard, *Bibliographie Voltairienne* (Par. 1841). Among the principal works dealing with the facts of V.'s life are Duvernet, *Vie de V.* (Par. 1796); Condorcet, *Vie de V.* (Geneva 1787); Peignot, *Recherches sur les Œuvres de V.* (Dijon 1817); Durdent, *Histoire Littéraire de V.* (Par. 1818); Lepan, *Vie Publique, Littéraire, et Morale de V.* (Par. 1819); Paillet de Warcy, *Histoire de la Vie et des Ouvrages de V.* (2 vols. Par. 1823); Longchamp et Wagnière, *Mémoires sur V. et ses Ouvrages* (Par. 1825); Bungener, *V. et son Temps* (Par. 1851; Eng. trans. Lond. 1854); Ars. Houssaye, *Le Roi V.* (Par. 1858); L'Abbé Maynard, *V. sa Vie et ses Œuvres* (2 vols. Par. 1867); Pompery, *La Vrai V. L'Homme et le Penseur* (Par. 1867); John Morley, *V.* (Lond. 1872); and Desnoirresterres, *V. et la Société Française au XVIIIe Siècle* (8 vols. Par. 1867-1878). This last work is the fullest of all the lives, and it has been crowned by the French Academy. The separate volumes are so many monographs, as vol. i. *La Jeunesse de V.*; vol. ii. *V. au Château de Cirey*. M. Desnoirresterres has also published *Iconographie Voltairienne: Histoire et Description de ce qui a été publié sur V. par L'Art Contemporaine* (Par. 1879).

Volterr'a, a town of Italy, province of Pisa, 5 miles from the railway station of Saline, which is 48½ miles S.E. of Leghorn by rail. It is surrounded by ancient walls with great gates, the chief of which is the Porta all' Arca. The cathedral, opened in 1120, contains fine marble sculptures; the baptistery of St. Giovanni and the church of St. Francesco have valuable frescoes and other paintings. The citadel, founded in 1343, with a more modern addition called Il Masteo, is now used as a penitentiary. In the Palazzo Communale is the Museo Civico, founded in 1208, and containing a valuable collection of Etruscan antiquities and a library. V. has also remains of baths and an amphitheatre. Large alabaster works are the main industry of the town. At Saline are important salt-works and borax springs. Near V. are also several Etruscan burying-places and a subterranean labyrinth. Pop. (1874) with district, 13,402. The ancient *Volaterræ* (Etruscan *Velathræ*), V. was one of the twelve great Etruscan cities. The Romans took it in 474 B.C., and it became an important *municipium*, resisting a siege by Sulla for two years.

Vol'tri, a town of Italy, province of Genoa, on the Gulf of Genoa, 10 miles W. of Genoa by rail. It contains the fine church of Madonna dell' Acqua, and numerous villas, which indeed line the coast from Genoa. V. has numerous paper factories. Sulphur, which abounds in the neighbourhood, is employed in the manufacture, and is supposed to improve the quality of the paper. The sulphurous springs (Acqua Santa and Acqua della Penna) are frequented by invalids suffering from skin disease. There is also a good harbour and some trade. Pop. (1871) 5943. Here, on 18th April 1800, the Austrians were defeated by the French under Massena.

Volumet'ric Anal'ysis, a name given in chemistry to a method of analysis, in which the quantity of a substance present

in a given solution is estimated by the amount which must be added of a given standard solution so as to produce and complete a characteristic reaction. The principle of the method, which was first suggested by Gay-Lussac, is based upon the laws of equivalence (see ATOMIC THEORY), and its success depends on the existence of a characteristic and easily recognised reaction. See ACIDIMETRY and ALKALIMETRY for particular cases which are included under the method.

Vol'untaryism is the designation of that system of Church polity which denies to the State the right of interfering in matters of religion, either by patronage or control; which asserts that the Church should be supported only by voluntary gifts, and that its members should be left entirely free to regulate its affairs. This definition would be accepted so far as it goes by all who claim to be called Voluntaries. There are many, however, who would not be satisfied with it. Looking rather at the rights of the subjects of the State than at the duties and privileges of the members of the Church, they would define V. as the principle which demands religious equality and liberty of conscience for all citizens. They are not satisfied with such equality as is secured by the abolition of tests, and the free admission of qualified candidates to offices of honour and emolument, irrespective of creed. They demand that all churches should be placed on an equal footing in the eye of the law, and that the exceptional privilege of establishment and endowment accorded to those who adhere to the creed and ritual recognised by the State should cease; and assert that all legislation which in any way furthers one form of religious opinion rather than another is inequitable. They maintain that liberty of conscience is as really infringed by the compulsion which exacts support for a creed or a form of worship of which the taxpayer does not approve, as by the persecution which compels him to profess the creed or to conform to the ritual. They are therefore as firmly opposed to the teaching of religion in State-supported schools as to the maintenance of State-supported churches. Nor is their opposition confined to such legislation as enacts the payment of taxes for religious purposes. They deem it inconsistent with the voluntary principle to enforce, for example, the keeping of the Sabbath on the ground that it is a divine ordinance. They would not deny to the civil authority the right to arrange, in view of the physical and moral well-being of the community, that one day in seven should be observed as a day of rest; but they would reckon it a violation of the rights of conscience to base the enactment on the authority of the Mosaic or Christian law.

There are some voluntaries, however, who do not carry the principle they profess so far as those whose position we have indicated. They limit its application to the relation between Church and State. They believe that the Church is a divine institution, which by the ordinance of its Founder is forbidden to enter into alliance with the civil power. They hold that He has laid it as a permanent and universal obligation on His people to maintain and extend the Church, and that this provision is exclusive of aid contributed by legal enactment. They believe that it is as inconsistent with the spirituality of the Church to accept the support of the public exchequer, as to permit its doctrine to be propagated by force. They hold that the only security which the Church can have for that freedom from control which they deem essential to her healthful existence, is that she undertake the whole responsibility of providing for her own support. Voluntaries of this class do not necessarily object to such recognition of religion by the State as does not interfere with the free and unaided action of the Church. They believe it to be consistent with their principles that the legislature should give effect to the teaching of scripture; and they do not deem it unlawful to provide for religious instruction in schools supported by public rates. These positions are maintained by some professing V., but it is doubtful whether they are perfectly consistent with the principle.

Both in England and Scotland V. was adopted as a practical means of Church support before it was accepted as a theory. The Nonconformists of England in the 17th c., and the Seceders of Scotland in the 18th, did not separate from the established churches because they disapproved of the connection between Church and State. They were driven out because they could not conform to the prescribed ritual, or acquiesce in the decisions of the Church courts. In their state of separation they maintained for a considerable time the principle of establishments, till gradually, through experience of the freedom they had found beyond the pale of the national Church, and of the adequacy of the Voluntary system to support the ordinances of religion, they came to accept V. as a theory. The largest of the Voluntary churches of Scotland still asserts the lawfulness of establishments; and in the next largest, V., though all but universally professed, is not a term of communion.

Volunteers' are part of the reserve military forces of Great Britain, available for defence against invasion. The oldest volunteer body in the country was the Honourable Artillery Company of the City of London, instituted in 1485, and revived, after a period of suspension, in 1610. This force took the side of Parliament in the Civil War, and was of great assistance. An organisation of V. on a grand scale took place towards the end of last century. In 1793–94, on a threatened invasion from France, a force of nearly half-a-million of men sprang to arms, and 150,000 were actually reviewed at one time by George III. These corps were gradually disbanded on the cessation of the danger, and the only reserve force existing during the following half-century was the militia. Two volunteer corps were formed in 1857, one in London (the Victoria Rifles), and one in Devon. In 1858 considerable alarm was felt in this country as to the intentions of France and the position of the nation; its small standing army contrasted with the great military organisations of the Continent caused general anxiety. The result was the volunteer movement, which was inaugurated with complete success. A War Office order, signed 12th May 1859, sanctioned the formation of volunteer corps, and a force of nearly 150,000 men was in existence in the course of a year. In 1860 the Queen reviewed 18,450 volunteers in London, and a still larger number in Edinburgh. In the same year, Government, which had hitherto left the movement to the public spirit of the community, appointed paid adjutants and drill instructors, and established a staff of inspectors. In 1870 the number of V. had increased to 170,000, and according to the statement of the Secretary of War in moving the army estimates in March 1879, the enrolled V., including the staff, were at that date 203,213 strong.

The volunteer force is regulated by the Volunteer Acts of 1863, 1868, 1869, the Regulation of the Forces Act of 1871, and Orders in Council which may be issued from time to time. It is localised in corps, a certain number of which are attached to the brigades for each subdistrict of the army. It cannot be employed to put down civil disturbance, but it may be embodied upon invasion, or an apprehension of invasion. This step must be communicated to Parliament; or, if Parliament be not sitting, then to the country by an Order in Council.

A company of V., sixty in number, with a captain and two subalterns, may be formed in any place. Four such companies are entitled to a major-commandant, and six companies constitute a battalion, for which Government appoints a military officer as adjutant. If one corps have more than twelve companies, it is usual to divide it into two battalions. A number of detached companies in a scattered district may be grouped together to form an administrative battalion. The adjutants and sergeant-instructors are subject at all times to the Mutiny Act—the other V. only when actually embodied. All V. must take the oath of allegiance, and must be at least seventeen years of age. They can leave the force on giving fourteen days' notice. The required height for the artillery is 5 feet 6 inches, for other corps 5 feet 3 inches, and the required width of chest 32 inches. V. may be (1) *honorary*, entitled to wear the uniform although not enrolled; (2) *non-efficient*, enrolled but still learning the volunteer drill and discipline; and (3) *efficient*. An efficient volunteer is defined by Order in Council, August 1874 (substituted for schemes of 27th July 1863 and 15th October 1872). He must have attended a certain number of drills, and be certified by the commanding officer and adjutant of his corps to have a competent knowledge of his duties. It is according to the number of efficients that the Government aid to volunteer corps is regulated, a capitation grant of 30s. annually being voted for each. In addition, a special grant of £2, 10s. is given for each officer and sergeant who holds a certificate of proficiency obtained by a severe examination, and small allowances are made in cer-

tain districts to cover the cost of attending battalion drills. Adjutants, sergeant-instructors, and arms are supplied by the State. The volunteer expenditure of the Government for 1878–79, exclusive of arms and ammunition, amounted to £512,400.

The *National Volunteer Association*, established in 1859, holds annual meetings in July of about a fortnight's duration at the camp at Wimbledon, and the shooting prizes offered by it have stimulated the production of a splendid body of marksmen throughout the country. The subscription to the association is £1, 1s. annually, or £10, 10s. for life. There are about 100 sub-associations. At the Wimbledon Meeting of 1878 the prizes numbered 1753, and amounted in value to £14,684. To win the Queen's Prize of £250 is the highest ambition of a marksman. Among the most interesting contests are those for the International Trophy and the Elcho Shield, the former shot for by 3 twenties and the latter by 3 eights, representatives of English, Scottish, and Irish V. Owing to an alteration in the rules confining the competition for International Trophy to Wimbledon instead of its taking place in the ground of the last winner, the Scottish team have ceased to compete for it. The Elcho Shield has been won nine times by England, and four times each by Scotland and Ireland. The Irish representatives are chosen from Irish volunteer corps in Great Britain, as though the subject has been repeatedly mooted, the volunteer acts have not yet been extended to Ireland. At Shoeburyness there is an annual gathering of the Volunteer Artillery Association (the artillery of the force numbering about 30,000 men) similar to the rifle meeting at Wimbledon. Each corps is entitled to select its own uniform. V. will probably be armed before long with the Martini-Henry rifle, like the regular army. An abortive attempt was made in 1878 in view of Eastern complications to raise a volunteer force for service abroad. The Government declined to recognise such a body.

Volu'ta, a genus of Gasteropodous Mollusca (q. v.), the type of the family *Volutidæ*, having a turreted or convoluted shell, the shell-aperture being notched in front. There is no speculum, and the foot is large and well developed. To this family also belongs the genus *Mitra*. In the genus *V.* itself the spine of the shell is shut, and the *columella* or central pillar or axis of the shell is plaited. In the allied genus *Mitra* the mouth to the shell is small, and the shell itself spindle-shaped. Many species of both genera occur in modern seas: the genus *V.* first occurs in the Chalk in a fossil state.

Volute'. See Column.

Vol'vox, a genus of minute unicellular *Algæ* which congregate into colonies. The best-known species is *V. globator*, found in stagnant water, in which it swims about with a rotatory motion. The colony consists of a variable number of plants united into a spherical mass just visible to the naked eye, by a gelatinous investment from which the cilia project. The mass is constantly breaking up into free factors, which in turn pass through a similar divisional process. This non-sexual reproduction takes place to an unlimited extent. The sexual reproduction is by antheridia and volgonia. Only a small number of cells in a colony are sexual. The vospheres are large and surrounded by a gelatinous cell-wall, the vogonium. The spermatozoids are developed in smaller cells, the antheridia, and fertilise the vosphere by penetrating the gelatinous wall. An allied genus is *Gonium*, in which the colony assumes a quadrangular shape.

Vol'vulus (Lat. *volvere*, 'to twist') is the term used in surgery to signify a twisting of the intestine, producing obstruction to the passage of its contents, and strangulation of the part involved. Three forms of V. are described by surgeons—(1) when a portion of intestine becomes twisted on its own axis, a condition which may occur in the ascending colon; (2) when a portion of the mesentery is twisted into a cone dragging the intestine with it, a condition which may occur in the small intestine; (3) when a portion of intestine with its mesentery is coiled round another portion of intestine, so as to compress it and close the passage. The sigmoid flexure or the cæcum may form the axis round which the other portion is coiled, and this is the most frequent form of V. There are several other affections of the intestinal tube giving rise to internal strangulation, and similar symptoms to those of V.

The first rule of practice in the treatment of such cases is to abstain from irritating the bowels by purgatives. Nourishment should be given in the fluid and most concentrated form, and in great part by rectal injection. Small pieces of ice should be given to subdue thirst, and opium to alleviate suffering. Belladonna may also be given until the full physiological effect of the drug has been produced, and by this means serious obstruction may be overcome. Mr. Pollock remarks that 'relief in a twist of the sigmoid flexure is just possible without opening the abdomen, provided the long tube be introduced into the distended gut, its contents drawn off, and the twist be reduced by the altered position of the bowel. But no operation for the ultimate relief of the patient will be successful unless the intestines be unloaded first, and the twist then reduced.' Surgical operations may have for their object to relieve the strangulation, or to give an artificial exit to the fæces above it, and colotomy may be practised on either side when the seat of obstruction is in the large intestine. The operation is of a very formidable nature; but is frequently successful, and may prolong life for a considerable time.

Vo'mer (Lat. 'a ploughshare'), a single bone of the Skull (q. v.), so named from its shape. It is placed at the back part of the nasal cavity, and aids in forming the partition separating one nostril from the other. It articulates with the sphenoid and ethmoid bones, and with the two upper maxillary and palate bones. No muscles are attached to it. There is a well-marked groove—the *naso-palatine groove*—in each lateral surface of the bone, which transmits the naso-palatine nerve.

Vom'iting is a very common symptom of disease, but it cannot be considered as a disease *per se*. See Stomach, Diseases of; Indigestion, Sea-Sickness, Sarcina Ventriculi, &c.

Von'del, Joost Van den, perhaps the greatest of Dutch poets, was born November 17, 1587, at Koln, the son of a respectable Dutch couple who had left Antwerp on account of their Mennonite opinions, but before long returned to Holland and settled first in Utrecht and in Amsterdam in 1597. In this latter city V. continued his father's hosiery business, but after his marriage in 1610 left the main management of it in the hands of his wife, and devoted himself to study and the cultivation of his poetic faculty. Though his first poem dates from 1605, he was twenty-five years old before he began to make himself acquainted with Latin, French, and German, as a means of intellectual culture. In 1641 he became a Roman Catholic, was afterwards overtaken by financial ruin, and from 1658 to 1668 was forced to drudge as a bank clerk, but at last obtained a pension from the city. He died at Amsterdam, February 5, 1679. 'In V.,' says Jonckbloet, who is far from a partial critic, 'Dutch poetry reached its zenith.' His principal works took the form of dramas, but the really vital element in all that he wrote was the lyrical. His best pieces are of doubtful success considered as plays, and the worst are redeemed by fine choral passages. His occasional bombast and bathos are more than counterbalanced by a fine play of fancy, a fluency and fiery movement of expression, and masterly management of the verse. His services to the Dutch language in clearing it of barbarisms can hardly be rated too highly. Of his thirty-three plays it is enough to mention *Het Pascha* (1612), on the deliverance of the Israelites from Egypt; *Palamedes* (1625); *Gysbrecht van Amstel* (1638); *Lucifer* (1654); *Jephtha* (1659); *Koning David* (1660); *Adonias, or Fatal Ambition* (*Ramp-zalige Kroonzucht*) (1661). These are all written on the recognised Dutch plan—in Alexandrines, in five acts, and with choral interludes between the acts. The *Lucifer* is of interest as an anticipation in a small degree of Milton's *Paradise Lost*, which it resembles in its covert allusions to contemporary politics. V.'s minor poems are very numerous, and he also translated Sophocles's *Electra*, *Œdipus*, &c., and parts of Horace, Virgil, and Ovid. Lennep edited a complete edition of his works (12 vols. Amst. 1850–69), Grimmelt and Jansen translated his poems (Munich 1873). His life, written by his friend Gerard Brandt in 1683, was printed by Verwijs. See also Bakhuizen van den Brink, *Studiën en Schetsen*; G. Penon, *Hist. en Bibl. Beschouwing van Vondels Heldichten*; Jonckbloet, *Geschiedenis der Nederl. Letterkunde* (vol. ii. pp. 78–164 Gröningen 1874). The tricentenary of his death was celebrated (1879) by the opening of a V. exhibition, containing portraits, &c. of the poet.

Voronej', a government of Russia, surrounded by Tambov, Saratov, the country of the Don Cossacks, Kharkov, Kursk, and Orel. Area, 25,437 sq. miles; pop. (1870) 2,152,096. The surface is in general level, with gentle undulations and chalk hills of no great elevation. The principal river is the Don, with a course from N. to S. of 390 miles. It receives near the town of V. the river V. with its affluent the united Usman and Chava. The principal crops raised are corn, potatoes, beetroot, tobacco, garden produce, and sunflowers, from the seeds of which an excellent oil is procured. In the fine pastures of V. horses and cattle are largely reared. The chief exports are corn and other agricultural produce to Rostov, wool to Kharkov, cattle to St. Petersburg and Kharkov, and horses to most of the governments of Russia.—**V.**, the capital, at the influx of the river V. into the Don, is 310 miles N.N.W. of Rostov by rail. Founded in 1586 as a stronghold against the Tartars, it first became important in the time of Peter I., to whom a monument was raised here in 1860. It has 22 churches, 3 monasteries, extensive tanning industries, and carries on a large trade in corn, sugar, and oil. Pop. (1874) 42,150.

Vor'tex. When any portion of a fluid is set rotating round an axis a V. is produced. Familiar examples are seen in eddies, whirlpools, waterspouts, whirlwinds, and on a larger scale in cyclones and storms generally. The theoretical investigation of V. motion forms a difficult branch of hydrokinetics, and only lately has any distinct progress been effected, mainly by the labours of Stokes, Helmholtz, and Thomson. Helmholtz has proved that if, in a frictionless fluid, a V.-filament, *i.e.*, a column rotating round a central axis, exists, it must either return into itself so as to form a V.-ring, or it must extend through the fluid till it reaches the bounding surface; and also, that where such V.-motion does exist it must always exist, and where it does not exist it never can by physical means be made to exist. Hence the reason why we can form vortices at all is because our fluids are not frictionless; indeed, fluid friction is not only the sufficient but seems to be a necessary cause of V. motion, so that practically V. motion is an inevitable accompaniment of the relative motion of portions of fluid. Of course, because of this friction a V.-filament left to itself speedily disappears, its energy being lost in overcoming the viscosity of the fluid. Another of Helmholtz's interesting theorems is that if a V.-filament is drawn out, it at the same time contracts and rotates faster. This may be effected by moving the filament terminating in two bounding surfaces into a region where the surfaces are further apart. Upon the indestructibility of V. motion Thomson has built his beautiful hypothesis of the V.-atom, which is simply a V.-filament returning into itself after, it may be, several knottings. The simple V.-ring is frequently formed by the smoke emanating from a funnel or a cannon's mouth, and may be very simply produced, as was done first by Tait, by projecting smoke-rings from a hole in one side of a box filled with sal-ammoniac by impacts on the cloth or indiarubber sheeting which forms the opposite side. By such apparatus various curious properties of these V.-rings may be demonstrated, such as their rebounding after collision like elastic solids, their spreading out indefinitely as they approach a plane surface, and the tendency which the foremost of two rings has to expand and slacken speed and permit its contracting and accelerated successor to shoot through it. See Tait's *Recent Advances*, and Stewart and Tait's *Unseen Universe* for a description of V.-rings and their properties, and an explanation of Thomson's V.-Atom Theory. See under HYDRODYNAMICS for a description of Reynolds' interesting experiments. For the mathematics of the subject the reader may consult Clifford's *Kinematic*, or the original papers of Helmholtz and Thomson. The latest application of the V. theory which Thomson has made is to explain the curious anomalies existing in the tides of the English Channel. His results were given in a paper read before the Royal Society of Edinburgh in March 1879.

Vorticell'idæ. See BELL ANIMALCULES.

Vor'tigern, a British prince who flourished in the 5th c. According to Gildas, Bede, Ethelwerd, and the *Old English Chronicle*, he invited Hengist and Horsa to come over and assist him against his enemies the Picts and Scots. Nennius, on the other hand, represents the German chiefs as exiles who came to the island unasked. Whichever form of the story be true, it seems certain that after a short time the new-comers, reinforced by fresh bands of their countrymen, turned against V., and wrested from him the Kentish territory. Nennius is the first to bring 'the beautiful daughter of Hengist' on the scene. He does not, however, name her. This is first done by Geoffrey of Monmouth (12th c.), who in the main follows and expands the version of Nennius. Geoffrey calls her Rowena, or, according to some MSS., Ronwen and Ronwenna; and he is the first to tell the familiar legend of the lady making a low curtsy to V. and saying, as she offered him a cup of wine, 'Lauerd King, wacht heil,' and how the 'devil' made him so enamoured of the lovely pagan that he married her that same night. There is something like unanimity in the chroniclers regarding V.'s character. He was at once tyrannical and lascivious; and monkish indignation (as expressed in the legend of St. Germanus) affirms that he was finally destroyed by fire from heaven. We may at least safely presume that V. came to a violent end, probably in conflict with the heathen adventurers who had established themselves in his dominions.

Vosges, a department in the E. of France, bounded N. by Meurthe-et-Moselle and Meuse, W. by Haute-Marne, S. by Haute-Saône, and E. by Elsass. Area 2269 sq. miles; pop. (1876) 407,082. The surface is covered in the E. by the wooded summits of the V. Mountains, and in the W. consists of fertile undulating plains. It is watered by the Moselle, with its affluents the Moselotte, Vologne, Madon, and Meurthe; the Meuse with the Mouzon and the Vaire; and the Saône with its affluent the Coney. In 1876 there were under cultivation 432,000 acres (12,992 under the vine). In the same year the chief agricultural products were:—wheat, 1,685,060 bushels; oats, 2,750,000 bushels; potatoes, 17,600,000 bushels; wine, 3,234,000 gallons; besides hemp, flax, beetroot, hops, fruits, and tobacco. The industries include silk and wool spinning and weaving, embroidery and lace-making, bleaching and dyeing, and the manufacture of glass, pottery, paper, beet-sugar, beer, leather, and machinery. The capital of the department is Epinal (q. v.).

Vosges Mountains, a range of hills in the E. of France, bounding the valley of the Rhine on the W. and parallel with the Schwarzwald in Baden. They are connected in the N. with the Hardtin Rhenish Bavaria, in the S.W. with the Faucilles, the Côte-d'Or, and the Cevennes, and in the S. they unite with offsets from the Jura. The summits are usually rounded, hence called *ballons*, and are covered with a rich green turf, on which for six months of the year large herds of cattle graze. Their sides are clothed with forests of fir, oak, and beech. Their highest summits range from 3000 to over 4000 feet, culminating in Ballon de Guebriller, 4700 feet above the sea.

Voss, Johann Heinrich, a German poet, translator, and philologist, was born at Sommersdorf in Mecklenburg, 20th February 1751, entered Gottingen in 1772 as a student of theology, but soon renounced this branch of study and gave himself up entirely to philology. He became one of the most celebrated members of the Göttingen Hainbund, a union of young poets of the period who took Klopstock for their model, and when in 1775 he removed to Wansbeck, he from there edited the *Musenalmanach*, the organ of the *Bund*, a periodical which was enriched by some of the early productions of Goethe. In 1778 V. became rector of the school at Ottendorf, and in 1782 of that at Euten. From an early period his literary career was one of continuous labour. He published translations of Homer and Virgil, and engaged in a long and bitter controversy regarding philological questions with Heyne. In the *Almanach* he published several original pieces of poetry, and in 1795 at Königsberg he issued his chief poem, *Luise; ein Ländliches Gedicht* (Eng. trans. by James Cochrane, Edin. 1852), which tells, in hexameter lines, the story of the courtship and marriage of a country clergyman's daughter. This work was received with universal favour, and it is certainly his best original production. In 1802 V. went to Jena, whence he was called in 1805 to the University of Heidelberg. Here he continued his translations. Of these the chief were renderings into German of Horace, Hesiod, and Orpheus, Theocritus, Bion, and Moschus, Tibullus and Aristophanes. His translation of Shakespeare (9 vols. Leip. 1819–30), which he accomplished with the aid of his two sons, was a work of little merit, at least in comparison with Schlegel's magnificent production.

Of his other works in this direction his rendering of the Arabian Nights and (with Höltz) of Shaftesbury's *Philosophical Works* (3 vols. Leip. 1776–79) may be mentioned. The last years of V.'s life were spent in polemical conflict with the representatives of mystico-romantic tendencies. What gave this conflict a certain personal bitterness was the acceptance of Roman Catholicism by his former friend Fritz Stolberg, an act which V. could only regard as a traitorous desertion of the cause of rational thought and progress. V. died at Heidelberg, 30th March 1826. As a writer his good qualities are his vigorous and clear force of expression, and when moralising in a sort of direct didactic vein he is at his best. As a descriptive poet his beau ideal is cosiness, and he expends all his force in describing some comfortable dinner in a snug parlour. But he has not the power of touching commonplace things in an uncommon way; his is no Midas' gift; and a vast proportion of his poetry is in consequence flat, uninteresting, and commonplace. Yet it is somewhat remarkable that what he could not create he could transmute from one language to another. His translations of Homer and Horace are masterpieces: they are as perfect as translations can ever be. He has the merit, moreover, of having made the hexameter one of the recognised metres in German poetry; and we still think of *Luise* with gratitude when we remember that it suggested Goethe's exquisite *Hermann und Dorothea*. Among the more recent editions of V.'s *Sammtliche Werke* are those published at Leipzig (5 vols. 1853) and Berlin (5 vols. 1869). See Paulus, *Lebens und Todeskunden von V.* (Heidelb. 1826) and Herbst's *V.* (2 vols. Leip. 1872–76).

Voss'ius, or **Voss, Gerhard Johann**, an eminent classical scholar of the 17th c. Though born at Heidelberg (1577) he was of Dutch descent, and the greater part of his life was spent in Holland. Educated at Dort and Leyden, he obtained in succession the principalship of the theological college (1614) and the professorate of rhetoric (1621) in the latter of these cities. In 1631 he was called to the chair of history in the Amsterdam gymnasium, where he died, March 27, 1649. V. was distinguished not only by erudition but by philological insight. His *Etymologicum Latinæ Linguæ* (Amst. 1662 and 1695; new ed. by Mazocchi, Naples, 1762–63) is even now a serviceable work, and his *Aristarchus, sive de Arte Grammatica, Lib. VII.* (1635; new ed. by Eckstein and Förtsch, Halle, 1833–34), was greatly in advance of the methods of his time. In his history of the Pelagian controversy (Amst. 1655) he declared in favour of the Arminians. His *Opera Omnia* were edited by his son Isaak (6 vols. Amst. 1695–1701).—**Isaak V.** was the fifth of the six sons of Gerhard V., and was born at Leyden in 1618. In his youth he had the advantage of such professors as Salmasius, Gronovius, and Heinsius, and this was followed up by a wide range of foreign travel in France, England, and Italy. Appointed in 1646 historiographer of the states of Holland, he held the post for only two years, accepting in 1648 an invitation from Christina of Sweden; and for the last eighteen years of his life he lived in England under the patronage of Charles I. He died in London, as canon of Windsor, 21st February 1689. His moral character was quite in harmony with the standard of Whitehall. During service in church he used to amuse himself with Ovid's *Ars Amoris*, and the King wittily remarked that this strange divine would believe anything but the Bible. Most of his works were put in the *Index Expurgatorius*. It is sufficient to mention *De vera Ætate Mundi* (The Hague, 1659), *De Nili Origine* (The Hague, 1666), and *De Septuaginta Interpretibus* (The Hague, 1661), the last a defence of the chronology of the Septuagint.

Voussoirs. See ARCH.

Vow was a solemn promise to dedicate to a deity something of value on the fulfilment of certain conditions, or in the event of receiving from the deity something specially desired, such as deliverance from imminent danger, recovery from sickness, success in an enterprise, &c. Of the same nature as the offerings given in fulfilment of such promises previously made were offerings made purely from gratitude on receiving some mark of the favour of a deity; both were votive gifts. So prevalent was the custom among ancient heathen nations of bringing these *donaria* to their heathen deities, in whose temples they were hung up, that the priests were sometimes obliged to take them down because they were completely concealing the beauty of an altar or pillar. The commonest kind were pictures representing the history of the miraculous cure or deliverance vouchsafed upon the V. of the donor. The temples of Æsculapius were specially rich in these offerings, which, according to Livy, were pay for the cures that he had wrought among the sick. They consisted of images of metal, stone, or clay, as well as models of legs, arms, and other parts of the body which had been cured, and a catalogue of all the miraculous cures effected on his votaries was exposed to view on tablets of brass or marble. This practice was continued by the Christian Church. The churches and shrines of the saints were loaded and disfigured with pictures, images, and models in wood and wax of arms, legs, &c.

The practice also prevailed among the Jews (*cf.* Gen. xxviii. 18–22, xxxi. 13; Job xxii. 27; Ju. xi.; Eccl. v. 4). In the Mosaic law the making of vows was not enjoined; it was expressly left optional (Deut. xxiii. 22, 23; Prov. xx. 25; Eccl. v. 5); but regulations were given for those who chose to make them (Lev. xxvii.). The objects of a V. might be persons, houses, cattle, and land; all of which might be redeemed at a certain fixed rate of value, with the exception of sacrificial animals. But the first-born of man and beast, persons and things dedicated by the ban, and tithes, could not be the object of a V., because they belonged to the Lord by law already. A peculiar V. of abstinence was that of the Nazarite (q. v.).

Vow'el. See LETTERS.

Vul'can (akin to Lat. *fulgere*, 'to glisten,' or to Sansk. *ulkâ*, 'a meteor or firebrand'), in Latin mythology, the god of fire, whose festival fell upon August 23, and whose temple, near which grew a sacred lotus-tree, was said to have been built by Romulus. Roman poets transferred to V. all that the Greek myths related of Hephæstus (q. v.), and thus the two deities became identified.

Vul'can, the name given to the intra-mercurial planet which M. Lescarbault believed he observed crossing the sun's disc on March 26, 1859. In 1856 Leverrier had pointed out that to account for certain irregularities in the motion of Mercury it was necessary to assume the existence of matter between the sun and that planet, and Lescarbault's discovery was hailed as corroborating this theory. The subsequent but unsuccessful endeavours to observe another transit of this body cast grave doubts upon the whole question of existence, and until lately Lescarbault's object was supposed to have been a comet. In 1876, however, Porro and Wolf of Zurich recorded a similar transit; and on July 29, 1878, during the total solar eclipse, which was visible from America, a bright object was observed near the sun by two independent observers, Professor J. C. Watson and Professor Lewis Swift, who are both agreed that what they observed was a planet. Gaillot has compared the position of Watson's planet with the various orbits which Leverrier had assigned as the most probable orbits of Lescarbault's planet, and has shown it to be compatible with one of these. The period of revolution Gaillot fixes at 24·25 days, and gives reasons for believing the inclination of the orbit not to exceed 7°. From recent researches it would appear that earlier observations are on record than those of Lescarbault, notably one by De Vico in July 1837, and one by De Cuppis in October 1839.

Vul'canite, or **Eb'onite**, a form of hardened Caoutchouc (q. v.).

Vul'gate, The, holds the same place as the authentic, authorised translation in the Roman Catholic which the Septuagint holds in the Greek Church. By the beginning of the 5th c. several Latin translations are spoken of, both of the Old and the New Testaments, which in the case of the former were made from the LXX. Of these the best was the one in use in Italy, hence called the *Itala*, a name which is sometimes loosely applied to all the extant remains of the translations made previously to an improved one executed by Jerome (q. v.) in the end of the 4th c. About 382, at Rome, Jerome prepared a new translation of the New Testament, or, to speak more strictly, made a revised edition of the *Itala* New Testament, and revised the Psalter, which he again revised, along with the other books of the Old Testament, at Bethlehem in 384; this latter version receiving the name of the *Psalterium Gallicanum*, as the former that of the *P. Romanum*. But, finally, he made a translation of the Old Testament from the Hebrew. Of his superlative fitness for the work

there can be no doubt. Canon (now Bishop) Lightfoot (*On a Fresh Revision of the New Testament*; 1872) says: 'In the first fifteen centuries of her existence the Western Church produced no biblical scholar who could compare with St. Jerome in competence for so great a task.' And the advantages of his historical position were immense. 'There are extant,' says Mr. T. Graves Law, 'in our European libraries, no more than two or three Greek MSS., and perhaps as many Latin, which reach as far back as St. Jerome's own time. He probably had a dozen where we have one of the oldest class, such as the Vatican Codex, and many of a far earlier date, such as we can never hope to discover. Moreover, he could discriminate between these ancient forms of the text in a way no longer possible to us. We are ignorant of the sources from which our codices are derived, or of the character of their copyists. The caprice or heterodoxy of untrustworthy editors may have had much to do with some of their peculiarities. St. Jerome knew of editions which were thus to be avoided ("prætermitto eos codices quos a Luciano et Hesychio nuncupatos paucorum hominum asserit perversa contentio"), and, on the other hand, he made use of copies which from their known history and antecedents he could trust.' This translation at first met with considerable opposition as an innovation, but by the end of the 5th c. it stood on the same footing as the old Latin translations. Since the 7th c. it has remained the one acknowledged by the Western Church; only the Psalter is according to the *P. Gallicanum* (in the church at Rome the *P. Romanum* retained its authority till about 1566), and some of the apocryphal books—Baruch, Sirach, Wisdom, and 1st and 2d Maccabees—are according to the *Itala*. The Council of Trent (q. v.), on account of the great variety of revised editions of the V., declared (8th April 1546) that the Books of the Old and New Testaments, 'with all their parts as they were wont to be read in the Catholic Church, and as they are found in the ancient V. edition,' are to be held sacred and canonical. At the same time it was resolved to print the text only after the most careful revision, and the researches of Vercellone (*Studi fatti in Roma e mezzi usati per corrigere la Bibbia Volgata*, Roma 1864) and of Ungarelli (*Prælectiones de N. T. et Historia Vulgata*, Romæ 1847) have shown how carefully this was done. The official copy of the authentic V. appeared in 1592, and has ever since remained untouched. Protestant scholars know and admit its merit. Not a few would say with Michaelis that it is *Versionum una omnium præstantissima*. See Dr. Kaulen's *Geschichte der Vulgata* (Mainz, 1868), and Rönsch's *Itala und Vulgata* (2d ed. Marb. 1875).

Vul'ture (*Vultur*), the name given to *Raptorial* birds included in the family *Vulturidæ*, in which there are no 'eyebrows' and a naked head and neck, or at most covered with short feathers. The family *Vulturidæ* includes the vultures of the Old World. The American vultures form a special family, that of the *Cathartidæ*, in which 'eyebrows' are also wanting, and the head and upper part of the neck destitute of feathers. The bill is not markedly of the Raptorial type, the front toes are partially webbed, and the talons blunt. There is no inferior larynx, and a large crop is developed. In both families the wings are long and powerful, and carrion-eating habits prevail. Of the Old-World vultures, a well-known species is the Lammergeyer (q. v.). The Arabian V. (*V. monachus*) is found in Europe, Asia, and N. Africa. Its colour is a dark brown, whilst a hood-like ruff is developed on the neck. The Sociable V. (*Otogyps auricularis*) occurs in S. Africa. Its length is about four feet, and its colour a blackish-brown; the ruff on the neck is black. The Pondicherry V. (*Otogyps calvus*) inhabits India, and is distinguished by a bunch of white feathers springing from the breast. The Griffin V., or Fulvous V. (*Gyps fulvus*), occurs almost universally throughout the Old World. It is one of the largest species, and is of a yellowish-brown above, the ruff being white. The Egyptian or Alpine V. (*Neophron percnopterus*) is found in S. Europe and in Asia. It is also named Pharaoh's Chicken, and the White Crow, from its colour.

Of the New-World vultures, the *Sarcorhamphus gryphus* or Condor (q. v.), the King V. (*S. papa*), the Black V. (*Catharista iota*), and the Turkey or Red-headed Buzzard (*Cathartes aura*), are the best-known examples.

Vyása ('the distributor or arranger'), the traditionary author of the Vedas, the Mahabharata, the Puranas—in fact, of nearly all ancient Sanskrit religious literature. It is evident that in this name is mythically embodied the historical fact that these works at some period underwent a regular and authoritative recension. It merits notice that the Greek name of Homer is capable of being analysed with a similar result.

W.



The twenty-third letter in the English alphabet, found also only in the cognate Teutonic languages, such as German and Dutch. Its name of double *u* expresses its sound; its written character recalls the time when *u* was written as *v*. Like *y*, it is both a consonant and a vowel; in the former case representing *v*, in the latter case *u*. Its consonantal pronunciation in English arises from the proper phonetic value of long *u* = *oo*; and it is similar to, but not identical with, the French *ou*. The Fr. *oui* = 'yes,' as all beginners are with difficulty taught, has a shade of sound different from our 'we.' The combination '*wh*' is anomalous. The aspirate ought to be heard before the '*w*,' except in the case of a following *o*, as 'who,' when the *w* disappears altogether. In this matter the pronunciation of the Scotch is more exact than that of the English. W is also silent when preceding *r*, as 'write.' The vowel use of *w*, which is simply a substitute for *u* in diphthongs, is peculiar to the English language. In Welsh *w* is a vowel taking the place of long *u*. In German *w* is pronounced as our *v*, and Cockneys are said to make a similar confusion. The Franks who came under Gallo-Roman influence changed it into *gu*; *e.g.*, ward becomes 'guard'; wise (Ger. *weise*), 'guise'; war, 'guerre'; William (Ger. *Wilhelm*), 'Guillaume'; warranty, 'guarantee,' &c. In words adopted late into French this philological interchange has ceased, but the sound is preserved in *ou*, as Edouard = Edward. As an abbreviation, W. stands for west.

Waag'en, Gustav Friedrich, a writer on art, was born at Hamburg, 11th February 1794, and educated in Silesia, whither his father, a painter of some note, removed in 1807. As a volunteer he made the campaigns of 1813–14, but subsequently turning to art under the influence of Ludwig Tieck, to whom he was related, he studied at Breslau, Dresden, Heidelberg, and Munich, and after travelling in the Netherlands, published *Ueber Hubert and Johann van Eyck* (Bresl. 1822). He travelled with Schinkel in Italy in 1824, and was appointed director of the picture-gallery of Berlin in 1830. His subsequent life was spent mainly in art tours through Europe, in which he visited France, England, Spain, St. Petersburg, &c., and in writing his *Kunstwerk und Künstler in England und Paris* (3 vols. Berl. 1837–39), *Treasures of Art in Great Britain* (3 vols. Lond. 1854; supplement, 1857), *Kunstwerke und Künstler in Deutschland* (2 vols. 1843–45), *Handbuch der Malerei* (1860), *Handbuch der Deutschen und Niederländischen Malerschulen* (1862), *Die Gemäldesammlung der Kaiserlichen Eremitage zu St. Petersburg* (1864), and *Die Vornehmsten Kunstdenkmäler in Wien* (2 vols. 1866-67). He died at Copenhagen, 15th July 1868. Possessing a scrupulous knowledge of technique and a high-minded devotion to his subject, W. has the honour of having laid a sound basis for the more recent studies in higher criticism. His *Kleine Schriften* were published by A. Wottmann (Stuttg. 1875).

Waal, The (Lat. *Valis* or *Vahalis*), a branch of the Rhine, the main waterway of the larger Rhine vessels, which above Arnhem branches off into the province of Gelderland, and unites near Workum with the Maas. See NETHERLANDS.

Wabash', a river of the United States, rises in the W. of Ohio, flows through Indiana, forming for 120 miles the boundary between Indiana and Illinois, and enters the Ohio at the borders of Kentucky after a course of 550 miles. It is navigable up to La Fayette, a distance of 300 miles, and many steamers ply upon it, coal being plentiful along its banks. The two principal tributaries, the Tippecanoe and White River, are also navigable for steamers. By the W.-and-Erie canal the basin of the Mississippi communicates with that of the St. Lawrence.

Wace, a Norman poet, born in the isle of Jersey about 1120. Besides the various forms of his name, as Vace, Wacce, Waice, Guace, Gasse, and Guasco, some MSS. give him a different name, as Wistace, Huistace, Eustace, and Eustache. In the great majority, however, he figures as 'Maistre Wace;' Huet (17th c.) is the first to call him 'Robert.' He studied at Caen and Paris, and seems to have been employed in the former town in connection with a court of justice. Here, he tells us, he began to write translations, *servantois*, and metrical paraphrases, in which he explained to the people the meaning of the festivals and the merits of the saints whose days they celebrated. To this period, probably, belongs his poem, *C'est comment la Conception Notre Dame fut établie*, first edited by MM. Mancel and Trébutien at Caen in 1842. W.'s *Le Roman du Brut* in the MSS. bears the date 1155. His *Le Roman de Rou*, finished in 1160, was dedicated to Henry II., King of England and Duke of Normandy, who rewarded the minstrel with a canonry in the church of Bayeux. Nothing more is known of W.'s history. That he died in 1174 is only a conjecture. The *Roman du Brut* is mainly a translation into French of Geoffrey of Monmouth's Latin work the *Historia Brittonum*, but W. has enriched the original legend with additions gathered by himself during a visit to Brittany. The poem, which has over 15,000 verses, is marked by clearness, facility, and even precision of style. The first edition, from MSS. in the Paris libraries, was published by M. Le Roux de Lincy at Rouen (2 vols. 1836–38). *Le Roman de Rou* gives in metrical form the history of Normandy from the invasion of Rollo (Fr. *Rou*) to the reign of Henry I. It is divided into four parts not found together in any single MS. The first recites the incursions of the Norsemen; the second and third recount the histories of Rollo himself, of Guillaume Longue-Épée, and of Duke Richard I.; the fourth and by far the largest comes down to the year 1106. The poem contains more than 16,000 verses, partly octosyllabic and partly Alexandrine. The first complete edition was published by Pluquet (2 vols. Rouen 1827; Eng. trans. Lond. 1837). The latest edition by H. Andresen appeared in 1876. W.'s other works are *Chronique ascendante des Ducs de Normandie*, first printed by Pluquet (1825) in the 'Mémoires de la Société des Antiquaries de Caen;' *Vie de Saint Nicolas*, published (1850) by Delius of Bonn; and *Vie de la Vierge Marie, suivie de la Vie de S. Georges* (Tours 1859).

Wad, in Gunnery, is a compressible disc which separates the powder from the projectile. Formerly it was forced home immediately after the powder; in modern ordnance it forms a portion of the Cartridge (q. v.).

Wad, or **Bog Manganese,** is a massive brownish-black mineral composed mainly of the hydrated peroxides of manganese and iron. It is usually mechanically mixed with other oxides and organic acids, and is formed in low situations from the decomposition of manganese minerals.

Wadd'ing, Luke, born at Waterford in Ireland, 16th October 1588, after studying theology at the Lisbon Jesuit Seminary, entered the Franciscan order (1605), and became professor of divinity in the University of Salamanca. As chaplain to an embassy despatched to treat concerning the doctrine of the Immaculate Conception, he came in 1618 to Rome, and settling there, founded the Irish Franciscan College of St. Isidore (1625), acted as papal councillor in the great controversy with the Jansenists, whose tenets he shared at first but presently renounced, and was procurator of his order (1630–34) and vice-commissary (1645–

48). He refused a cardinal's hat, and died at Rome, 18th November 1657, having himself composed the *Annales Ordinis Minorum* (8 vols. Lyon, 1626-40; new ed. 22 vols. Rome, 1731-47) and *Scriptores Ordinis Minorum* (Rome, 1660; new ed. 1806), and edited Calasio's posthumous *Concordantiæ Bibliorum* (4 vols. 1621) and the works of Duns Scotus (12 vols. 1639).

Wadd'ington, George, D.D., son of Rev. George W., vicar of Tuxford, Nottinghamshire, was born 7th September 1793. A brilliant university career at Cambridge was rewarded by a fellowship in Trinity College; and after several years of foreign travel he received the vicarage of Marsham in Yorkshire. In 1840 he was made Dean of Durham, and in the following year Warden of Durham University. He died 20th July 1869. W. was a man of liberal opinions and abundant generosity: his gifts to benevolent institutions both in London and Durham were often princely in their amount. His chief works are *Journal of a Visit to Some Parts of Ethiopia* (Lond. 1822), *A Visit to Greece in 1823 and 1824* (Lond. 1825), *Present Prospects of the Greek or Oriental Church* (Lond. 1829), *History of the Church from the Earliest Ages to the Reformation* (13 vols. Lond. 1835), *History of the Reformation on the Continent* (3 vols. Lond. 1843).

Wadd'ington, Guillaume Henri, a French scholar and statesman, born in Paris in 1826, was the son of a naturalised Englishman who had settled in France as a cotton manufacturer. After four years (1841-45) at Rugby, W. went up to Trinity College, Cambridge, where he closed his career in 1849 by taking a first class in the classical tripos, obtaining a chancellor's medal, and assisting as No. 6 of the university crew in winning the race of the year. It was by his contributions to numismatics and his explorations in Asia Minor that he first attained to celebrity, and in 1865 he was rewarded by a place in the French Academy of Inscriptions. In 1871 he was returned by the department of Aisne to the National Assembly, where he became a supporter of the policy of M. Thiers. In 1876 he was chosen senator for the department of Aisne, along with M. Henri Martin and M. Saint-Vallier, and in the same year he became Minister of Public Instruction. His educational reforms, which sought to give the state full control over the universities, to diminish the influence of the clergy, and to widen the area of primary instruction, were rejected through the opposition of the clerical party. On 16th May he resigned office with the rest of the Simon cabinet, but in December he returned to power as Minister of Foreign Affairs under Dufaure, and as President of the Council formed the new cabinet in the presidential crisis of February 1879. In 1878 he was plenipotentiary of France at the Berlin Congress. Besides his share in the *Voyage Archæologique en Grèce et en Asia Mineure, fait par Ordre du Governement Français pendant les Années 1843 et 1844* (Par. 1847-77), a series of splendid volumes, of which two are devoted to Inscriptions, two to Explanations of Inscriptions, one to Monuments of Antiquity, and one to Architecture, W. is the author of *Edit de Dioclétian, établissant le Maximum dans l'Empire Romain; publié avec de Nouveaux Fragments et un Commentaire* (Par. 1864), *Mélanges de Numismatique et de Philologie* (Par. 1861-67), and *Inscriptions Grecques et Latines de Syrie* (1870).

Wade, Sir Thomas Francis, K.C.B., son of Colonel Thomas W., C.B., was born 1820, entered the army in 1838, and served in China and other parts of the East. He was appointed Interpreter to the garrison at Hong-Kong (1843), Assistant Chinese Secretary (1847), Vice-Consul at Shanghai (1852), and Chinese Secretary at Hong Kong (1855). His intimate knowledge of the Chinese character and language led to his being attached to Lord Elgin's Mission to China (1857-59), and as Chinese Secretary he accompanied his Lordship to Pekin on his Special Mission (1860). In 1862 he became Chinese Secretary and Translator to the British Legation in China, acted as Chargé-d'Affaires at Pekin (1864-65 and 1869-71), and in the last of these years was appointed Envoy Extraordinary, Minister Plenipotentiary, and Chief Superintendent of British trade in China. In November 1875 he was made a K.C.B. for his success in diplomacy and in furthering the interests of British commerce. W. is the author of *Tzü-Erh Chi* (1867), a progressive manual of the Chinese tongue both colloquial and literary.

Wa'ders. See GRALLATORES.

Wad'ham Coll'ege, Oxford, was founded in 1610 by Dorothy, widow of Nicholas Wadham, of Mayfield, Somersetshire, Esq., for a warden, fifteen fellows, fifteen scholars, two chaplains, and two clerks. One of the fellowships was diverted (1857) to the endowment of the chair of experimental philosophy; the scholarships have an annual value of £80, and are tenable for five years; and there are besides ten Hody exhibitions (six Greek, four Hebrew) of £50, two Wright exhibitions (1874) for scholars of Manchester grammar-school, &c. W. C., whose library is rich in rare Spanish books, presents to twelve livings, and in 1878 had 57 undergraduates, 213 members of Convocation, and 367 members on the books.

Wadī (Arab. 'ravine'), in Palestine and Arabia, means either a river or river-valley, or the basin of a torrent. Renan (*Lang. Semit.*) thinks this word was adopted by the Greeks and corrupted into *oasis*. It has passed into the Spanish *guad*, with which many of the Spanish river names begin; thus *W.-l-Kebir* (Arab. 'great river') appears as Guadalquivir, *W.-l-hajarah* ('river of the stones') as Guadalaxara. The ravines of Malta commonly go by the name of *Vyed* or *Wied*, a corrupted form of W.

Wad'set, in Scotch law, a name formerly used to denote a Mortgage (q. v.). See BOND. The word literally means a 'pledge' set or placed over a property. The root is seen in wedding, a 'plighting' or 'pledging' of faith, the betrothal, not (as now) the marriage. Comp. Lat. *vas, vadis*.

Wa'fer is a name given to the small piece of unleavened bread used in the sacrifice of the Mass (q. v.), and called after consecration the Host (q. v.). A bitter controversy arose between the Eastern and Western Churches when the use of unleavened bread was introduced into the latter in the 11th c. At the same time, according to some, the bread was formed in the shape of a penny, to represent the pence for which our Saviour was betrayed. Most likely it was connected with the development of the doctrine of Transubstantiation (q. v.) in the 11th and 12th centuries. At this time every means was adopted to prevent profanation. Thus the communion of children was discontinued. Anxious solicitude was shown in the administration of the cup to prevent spilling, and the use of the W. was probably adopted for the same reason as the cup was finally withheld from the laity altogether.

Wa'fers are thin discs of adhesive matter, formerly much used for securing letters, and still in use for attaching papers to each other, for legal seals, &c. Common flour W. are made by preparing a thin uniform batter of flour and water, pouring the preparation on greased wafer-irons, on which it spreads to a uniform thin sheet, and exposing it to the heat of a clear charcoal fire till it becomes a hard dry thin cake. The cake is allowed to cool, and the W. are then punched out with sharp cutting-punches. They may be coloured to any desired tint by mixing the appropriate dye-stuff with the batter previous to placing it on the wafer-irons. Transparent or gelatine W. are composed of thin sheets of coloured gelatine, to which a small proportion of sugar has been added to facilitate its solution, such cakes being similarly punched into small discs.

Wa'gers. See GAMING, BETTING, LOTTERIES, LAWS REGARDING.

Wa'ges is that share of produce which falls to the labourer employed in the creation of that produce. In ordinary language the term is generally restricted to the remuneration of what in common parlance are called 'workmen,' and certainly this is by far the most important use of the word. Correctly, however, the reward of clerks, professional men, and even capitalists, in so far as the last superintend their own works, are all W., while, on the other hand, the sum paid to most skilled workmen does not entirely consist of W., but part of it must be considered as interest on the original value, and reimbursement for the inevitable depreciation of their tools. The manner in which the produce of human effort is distributed, has been well represented in the following equational form :—

Produce = W. + Rent + interest on capital employed + Taxes.

That part of produce which goes to the labourer forms what is called the W. fund. Of course the rent, the interest, and the taxes may all be spent on W., and thus go to swell that fund, and it is by this constant process that the fund is renewed. In a country like ours, all money that is saved is for the most part spent in W., though in any special case of distribution of pro-

duce, the economic equation given above first obtains, whatever the ultimate destination of the components may be.

It is evident that the remuneration of the labourer in any country must depend (1) on the amount of the W.-fund, (2) on the number of people among whom it is to be divided. This simple and obvious truth has most important consequences. The rate of wages must be determined by the laws of demand and supply, and any attempt to fix an artificial rate by government enactment, must be (*a*) ineffectual or (*b*) hurtful, since while it is possible, by creation of artificial monopolies, &c., unduly to raise the rate of W. in one trade, this can only be effected by depressing it in others. The equation of produce exhibits in a striking manner the exact effect of strikes, locks-out, and generally every combination of employers or workmen. All such combinations aim at assigning a greater or less share of produce as W. In a strike production is stopped. Of course all suffer; but if trade be brisk, it often happens that the employer suffers far more than his workmen. His capital is lying idle; his skill is unexercised; he is paying rent and taxes as formerly. In such a case he quickly surrenders. But if trade be dull, and he cannot find a market for his goods, he is obliged to cut down production. This renders him so far independent of his workmen, and he is able to lower W. His workmen must live. It is now their turn to submit. It would be too much to say that a strike or lock-out is never justifiable. There are various ways in which masters and men may for a time secure to themselves more than their natural share. But that natural share is just the share which is fixed by the laws of demand and supply, and the competition which these generate would act just as forcibly were there never one trade dispute. The equation of produce likewise shows us how far the interests of workmen and employer are the same. They are the same in so far as the *amount* of produce goes; they are different in so far as that produce may be *divided* in very different ratios. In discussing the remuneration of the labourer, a distinction must be drawn between money W. and real W. The real reward of the labourer is not the sum he receives, but what that sum will procure for him. Thus, if the price of corn fall, his real W. are increased to a proportional amount, though the money payment remains the same. W., and the whole class of questions relating to the subject, are discussed in the works of Mill, Fawcett, Jevons, Cairns, W. Thornton, and in Walker's *W. Question and W. Class* (1877).

Wag'ner, Richard, originally **Wilhelm Richard**, an illustrious German composer of 'musical dramas,' and the leader of the 'Music of the Future' school, was born at Leipzig, May 22, 1813. He lost his father, a clerk of police, in infancy, and his education was of a desultory character. Poetry was a passion with him as a boy, and his mind was given up chiefly to verses and play-writing, till an acquaintance with Beethoven's works turned it into a musical channel. In 1833 he wrote an overture for the Gewandhaus concerts, and composed his first opera, *Die Feen*. He was Musical Director of the Magdeburg Theatre in 1836, where he produced *Das Liebesverbot*, an opera alike written and composed by him, which proved a failure. He was subsequently Musical Director at Königsberg and Riga. Impressed with the successes of Meyerbeer, he turned his thoughts to Grand Opera, and began an opera on Bulwer's story of *Rienzi*, in which his avowed aim was to produce grand scenic effects, ensembles, and finales. He looked to Paris as the goal of his artistic ambition, and left Riga on a voyage to that city. The vessel was driven by a storm to the Norwegian coast, where from the winds and waves he caught the inspiration which afterwards burst forth in the *Der fliegende Holländer*. Arrived at Paris, he was befriended by Meyerbeer and Schlesinger, a musical publisher, but his efforts were too fantastic for the taste of the gay city. In great straits, he supported himself by publishing songs and arrangements for the violin and cornet-à-piston, and by writing articles and novelettes in Schlesinger's *Gazette Musicale*, while he matured his two operas. *Rienzi* was produced at Dresden in 1842, with a success which obtained for him the post of Kapellmeister at the Opera House there. *Der fliegende Holländer*, which followed in 1843, marks a new epoch in his artistic history. The existing school of opera, he contended, was false, hollow, and unreal. The drama should be the centre of interest, and music, painting, and architecture only called in as accessories to give complete expression to the poet's thought. The arias of Italian Opera which retarded the action and distracted attention were to be set aside, and instead of recitative he advocated a 'melos,' or endless melody appropriate to each phase of the dramatic interest. For the subject of a drama he preferred a poetical national legend, and henceforward he looked for inspiration to no other source. *Tannhaüser*, the first of his creations from the German myth-world, was produced at Dresden in 1845, and *Lohengrin*, mainly through Liszt's efforts, at Weimar in 1850. Meanwhile the composer had had to leave Dresden on account of his advanced liberal opinions in politics; at Zürich he composed *Tristan und Isolde*, and began his series of works on the *Niebelungenlied*. After ten years of exile he was pardoned by the King of Saxony, but took up his residence in München, where he found King Ludwig of Bavaria an enthusiastic and generous patron. *Tristan und Isolde* was produced in 1865, *Die Meistersinger von Nürnberg* in 1868, *Das Rheingold* in 1869, and *Die Walküre* in 1870. In 1876 the latter two operas, along with *Siegfried* and *Die Götterdämmerung*, his four works on the *Niebelungenlied*, were produced at a theatre specially prepared at Baireuth in presence of the German Emperor and a host of admiring friends. In the same year he composed a March for the American Centennial Exhibition. His latest dramatic effort is *Parcival*. He conducted a series of concerts of his music in 1877 in London, where he had previously appeared at the Philharmonic Concerts of 1855. W., after much uncompromising opposition, has now received a complete recognition of his merits in Germany, to the character of whose people his works and music are most akin. In France they have never been received with favour, and they have not struck deep root in this country, notwithstanding the success of *Tannhauser*, *Lohengrin*, *Der fliegende Hollander*, and more recently of *Rienzi*. He is remarkably inventive in orchestral colouring and scenic effects, and has a high imaginative and poetic genius. There is, however, a flavour of rhapsodical incompleteness in all his efforts, and his true place in the musical world is probably below the isolated height accorded him by extravagant supporters. His views on art may be gathered from his collected writings, *Gesammelte Schriften und Dichtungen* Leip. 1871), including *Oper und Drama* (1852). See Hueffer, *R. W. and the Music of the Future* (Lond. 1874); Glasenapp, *W.'s Leben und Werke* (2 vols. Cass. 1876); Kastner, *W. Katalog* (Offenb. 1878).

Wag'on, or **Wagg'on**, a four-wheeled vehicle for transporting goods or heavy loads, but rarely passengers. Two-wheeled vehicles drawn by oxen were in use among the Egyptians, and most probably the 'wagons' sent by Joseph to bring his father to Egypt (Gen. xlv. 19) were a species of cart or chariot. The invention of the four-wheeled W. has been ascribed to the Phrygians. The ancient *plaustrum*, commonly two-wheeled, had sometimes four wheels, and was employed in carrying loads. The Romans also used the *petorritum*, a four-wheeled carriage, which they borrowed from the Gauls; the name is derived from the Gallic *petor*, 'four,' and *rit*, 'a wheel.' The Old English applied the terms [illegible]*n*, and *crat* or *cræt* (whence our word *cart*), indiscriminately [illegible]elling chariots. In modern England the W. is much used in [illegible]bandry and in transporting merchandise. It is generally drawn by two horses yoked abreast. The fore-wheels are smaller than the hind-wheels, and their axle is swivelled to the body of the W. to facilitate turning. In Scotland the one-horsed cart takes the place of the W. in England. The former economises power, for the horse partly bears and partly drags his load, whereas the animals yoked to the latter expend their force in pulling only, the whole weight of the load being distributed over the four wheels. The brewer's *dray* and railway *lorry* are varieties of the W. Robinson's dumping-W. has a body composed of three separate sections arranged in line and pivoted to the bed of the W. frame. It is employed by contractors on account of the facility and speed with which materials may be 'dumped' or discharged, by disconnecting the sections so that their open ends are tilted downwards.

Wag'on Train, in an army, is the train of wagons used in a campaign for ambulance, ammunition, pontoons, general service, stores, water, &c.

Wag'ram, a small village in lower Austria of about 800 inhabitants, lying on the Russbach, some 10 miles N.E. of Vienna, on the Vienna-Prague railway, was the scene of a great victory gained by Napoleon I. over the Archduke Karl, July 5th and 6th, 1809. The latter lost 25,000 men killed and wounded. The French loss was nearly as great.

Wag'tail (*Motacilla*), a genus of *Insessorial* birds included in the *Dentirostral* section of the order, and in the family *Motacilidæ*. This group in its turn forms a division of the larger family *Sylviadæ* or Warblers (q. v.). Of the wagtails the Red W. (*Motacilla Yarrellii*) is the most familiar species. It is common near every brook, and attains a length of 7 or 8 inches. The male is black on the head, neck, chin, and throat, and white on the sides of the face. White and black markings and patches also occur on the body, and the under parts are grey. The chin and throat become white in winter. The White W. (*M. alba*) has the throat and head alone black, the back and the upper parts generally being light grey. This bird is found in France and S. Europe. The beak of the White W. is broader than that of the pied species. The grey W. (*M. campestris*) is rather locally distributed in England. Its general colour is grey, but there are buff markings on the head and back. The throat and chin are black, and the under parts bright yellow. The average length is 8 inches. The Yellow W. or Ray's W. (*M. sulphurea*) derives its name from the yellow hue of the throat and under parts, the head being olive-coloured. It is common in pastures and meadow-lands.

Wahau'bi (Arab. *Wáhhábî*), a sect of reformed Mohammedans, founded at the commencement of the last century by Abd-ul-Wahhab ('servant of him who gives everything'), the son of a petty chief of the Nejd tribe in the Central Highlands of Arabia. Enlisting the nomad Arabs, from among whom all traces of the pure faith of Islam had disappeared, he raised the standard of revolt against the corruptions and vices of the Turkish court, and in favour of the purity of the Koran. Till his death in 1787 he was the prophet, rather than the general, of the movement, which rapidly spread throughout Arabia. The armies of Bagdad and Constantinople were defeated in several pitched battles, and the holy city of Mecca was captured in 1803. The interference of the Wahaubees with pilgrimage induced the sultan to entrust his most powerful vassal, Mehemet Ali, Pasha of Egypt, with the conduct of the war. Ibrahim Pasha, son of Mehemet Ali, retook Medina in 1812 and Mecca in the following year, following up his victories by the invasion of Nejd, and the burning of the W. capital. But the W. power was not broken; and at the present day it is said to be predominant in the Arabian peninsula, except along the narrow strip of coast that borders the Red Sea. According to Palgrave, the W. state contains 11 provinces and 316 towns or villages, of which the capital is Riad, with a pop. of 40,000. The total pop. is estimated at 1,220,000, including 47,000 fighting men. The W. religion is marked by few peculiarities beyond a fanatical adherence to the original precepts of the Koran and a general spirit of intolerance. Its followers are the Puritans of the East; they eschew fine dresses and the habit of smoking.

In the beginning of the present century the flame spread to India. Syud Ahmed, on his return from a pilgrimage to Mecca in 1[illegible], set himself up as a Calif or Defender of the Faith, and gathered round him at Sitana, on the N.W. frontier near Peshawur, a colony of devoted followers, Pathans and Hindustanis. There he preached a *jihad* or holy war against the infidels; but after some successes against the Sikhs he was defeated and slain by a general of Runjit Singh in 1831. But meanwhile the reform had spread throughout N. India. In the same year his followers, under the name of Feraizees, raised an armed riot in E. Bengal. The apostles whom he had instituted at Patna and other cities taught that the Calif or Imam was not dead but only disappeared; and they were continually sending arms, money, and recruits to the little band which still existed on the N.W. frontier. On the annexation of the Punjaub this band had transferred its fanatical hatred from the Sikh to the Christian infidel. In 1858, 1863, and 1868 regular expeditions were required to curb their inroads. In connection with the second of these occurred the W. state trials at Lahore, which disclosed a deep-rooted conspiracy among British subjects to assist the enemy; and again in 1870 the same story was told in the Patna Court for Lower Bengal. In 1871 the chief justice of Calcutta, who had presided at the Wahaubees' appeal, was assassinated by a Mahommedan glorying in his religious motives. But a stern policy of repression, which inflicted death on none but those who courted martyrdom in the field, or were murderers, stamped out the conspiracy; and it is now believed that the Mohammedan inhabitants of India, though their religion has undoubtedly been purified, are no longer liable to the charge of disloyalty. In the general census, very few returned themselves under the denomination of Wahaubees. See W. G. Palgrave's *Narrative of a Journey through Arabia* (Lond. 1865), and *The Indian Mussulmans*, by W. W. Hunter (Lond. 1872).

Waib'lingen, a town of Würtemberg, on the Rems, 15 miles E.N.E. of Stuttgart by rail, has a fine Gothic church (1459–88), two schools, a new Rathhaus, and manufactures of silk, cloth, leather, &c. Pop. (1875) 4128. From this town, or (according to Raumer) from another fortress of the same name on the Kocher, the Hohenstaufens assumed the appellation Waiblinger, corrupted by Italians into Ghibellini.

Waifs, in English law, are stolen goods that have been 'waived' or dropped by the thief when pursued. The name has been figuratively given to all unfortunates who have slipped their social moorings and drift about in helpless misery.

Wain'scot, a term now applied to figured oak wood used as wall linings and for other facings, and more particularly to any imitation of such oak in paint. It was originally applied to panelled linings generally, such as formerly were used as dados of apartments.

Waist, of a ship, the part of the upper deck between the quarterdeck and the forecastle.

Waits (akin to O. H. Ger. *wahta*), a term originally applied to *watchmen*; next, as these sang in rude rhymes the passing hours of night, to hired serenaders; and lastly to such musicians as go about playing and singing Christmas Carols (q. v.).

Wait'zen (Mag. *Vác*), a town of Hungary, comitat of Pestn, on the Danube, 23 miles N. of Pesth by rail. It is an episcopal see, has a cathedral built in 1761–77 on the model of St. Peter's at Rome, four other Catholic churches and one Protestant, deaf and dumb institute, bishop's palace, with classical and mediæval art treasures, and a prison (1857) in Gothic style. W. carries on an important trade in wine and cattle. Pop. (1870) 12,894. The town has been the scene of various battles between Hungarians and Turks, Hungarians and Austrians, and Hungarians and Russians, the most celebrated of which perhaps is that of 10th April 1849.

Wake. See VIGIL and FAIRS.

Wake'field, an ancient market-town in the W. Riding of Yorkshire, England, on the Calder, 9 miles S. of Leeds by the Great Northern Railway. It has five main streets, one of which slopes down towards the left bank of the Calder. The parish church of All Saints, in the Perpendicular style, was consecrated in 1329, but with the exception of the spire was rebuilt in the last century. It was 'restored' under the direction of Sir G. G. Scott (1857–74) at a cost of £20,000, including the spire, which now measures 237 feet in height. The other Episcopal churches are St. John's (1795), Holy Trinity, St. Andrew's, St. Michael's (1858), St. Mary's (1874), and Christ's (1875). On the bridge across the Calder is a very fine chapel, 'restored' in 1847. The public buildings of W. include a corn-exchange (1837), the town-hall, a court-house, a church institute, a mechanics institute, assembly-rooms, a grammar-school, at which Dr. Radcliffe and Bentley the critic were educated, a fine-art institute (1868), the W. Riding Pauper Lunatic Asylum, the W. Riding Prison, and a union workhouse. A magnificent railway station was opened in 1867; a new market, covering 2665 sq. yards, and a new hospital, costing £14,000, were commenced in 1876. The main industry of W. has long been the manufacture of woollens, worsteds, and hosiery, but this department of trade has of late years passed largely to other towns in the neighbourhood, and W. is now more important as a great corn-mart. There are extensive collieries, corn and flour mills, breweries, chemical works, foundries, and engineering works. The town has excellent communication with the neighbourhood by railways and canals. W. is practically the chief town of the W. Riding, and is the seat of the Probate and County court, the headquarters of the Riding constabulary, and contains the offices of the clerk of the peace and the Riding solicitor. Pop. (1871) 28,069.

Wakefield, Gilbert, a classical scholar and theologian, was born February 22, 1756, in the parsonage at St. Nicholas

of Nottingham, and in 1776 became a Fellow of Jesus College, Cambridge. After holding two curacies in the Church of England, he obtained (1779) a classical tutorship in a dissenting academy, and in 1786 he formally withdrew from his connection with the Established Church. For two years (1799-1801) he was imprisoned in Dorchester jail for a seditious libel contained in his *Reply to some Parts of the Bishop of Llandaff's Address to the People of Great Britain* (Lond. 1798), and a few months after his release he died, September 9, 1801. W. attacked the Church of England with more than the bitterness of a renegade, and keenly impugned the main docrines of Christianity and the expediency of public worship; but 'in domestic life he was,' according to H. C. Robinson, 'a most gentle creature, with the pale complexion and mild features of a saint.' As a critic he was rash, but suggestive and copious, and was considered by Dr. Parr 'as one of the best scholars produced by his own country in his own age.' Besides editions of Horace (1794), Bion and Moschus (1795), Virgil (1796), Lucretius (1796-97), a *Translation of the New Testament* (1791), and numerous pamphlets, W. was the author of *Poemata* (1776), *An Essay on Inspiration* (1784), *Silva Critica*, consisting of notes to the Scriptures from the secular classics (1789-95), and *Evidences of Christianity*. He wrote his own *Memoirs* (Lond. 1792; new ed. by Ruth and Wainewright, 1804), and his *Correspondence with Charles James Fox* was published in 1813.

Walcher'en, an island of the province of Zeeland, Netherlands, between the two mouths of the Scheldt. Area, 52,100 acres; pop. 43,171. It is a low, flat island, protected against the sea by thick dykes, and on one side by sand-hills. The island has, nevertheless, been subjected to several disastrous inundations. Fine wheat and potatoes are raised, and excellent cattle are reared on the rich pasture meadows. Fishing is also prosecuted. Saw-mills, tanneries, breweries, and shipbuilding yards afford employment to the inhabitants of its 18 villages and the towns Middelburg, Veere, and Flushing. *W. Expedition* was a disastrous scheme devised in Britain during the Napoleonic wars with the view of creating a diversion in favour of our Continental allies. After many delays, nearly 50,000 men, under the command of Lord Chatham, sailed for W. on the 28th July 1809. Instead of advancing on Antwerp the general devoted more than a month to the reduction of Flushing. Meanwhile, French reinforcements had poured into Antwerp, whilst the British army was decimated by sickness. The troops, with the exception of 15,000, were therefore withdrawn. This garrison, however, continued a prey to fever, and had also to return to England without further achievements.

Wal'deck (*W.-Pyrmont*), a sovereign principality in the W.N.W. of Germany, comprises the former county of W., girt by the Prussian provinces of Westfalen and Hessen-Nassau, and that of Pyrmont lying apart between Lippe, Hannover, Braunschweig, and Westfalen. Area, 438 sq. miles; pop. (1875) 54,711. W. is among the highest districts between the Rhine and Weser, the greatest elevations being the Hegekopf (2750 feet), near Stryck, the Ettelsberg (2703), and Pön (2519). The country, picturesquely diversified with vale and upland, plain and forest, is watered by the Weser, Eder, Werbe, Itter, Aar, Diemel, and Twiste. At Niederwildung are chalybeate springs, and at Pyrmont are famous steel and iron springs. The chief crops are rye, oats, and potatoes. The woods cover 105,142 acres; and in 1873 there were 5699 horses, 19,714 cattle, 59,859 sheep, 15,289 swine, 7707 goats, and 3073 bee-hives. Formerly of importance, the mining industry produced in 1876 iron-ore to the value of £743, as well as some manganese, &c. The principal export is the mineral water of Wildung (316,323 bottles in 1876), which is sent as far as Japan and China. The princely house of W. dates from the 12th c., and till the end of the 14th possessed Swalenberg and Sternberg. George Victor (born 1831) negotiated a 'Treaty of Accession' in 1867, by which he transmitted the administration to Prussia, himself retaining merely nominal power. The treaty was confirmed in 1878. See Kurtze, *Geschichte des Fürstenthums W.* (Arol. 1850), and *Beitrage* (*ib.* 1864 *et seq.*).

Walden'ses, or **Walden'sians** (*Valdenses, Valesi, Vaudois*, the last not to be confounded with *Vaudois*, equivalent to inhabitants of the canton Vaud or Waadt in Switzerland), an interesting community of Reformers before the Reformation which still maintains its existence as a separate Christian church. Its originator was Peter Waldo (Valdez or Waldus), a citizen of Lyon, who having procured a translation of parts of the Bible from two young priests, sought to frame his life after the example of the Apostles, sold his goods and gave to the poor, and began to preach the doctrine which he practised. By and by men of like mind joined themselves to him, and they became known as the *Poor Men of Lyon* (Pauperes de Lugduno). Jean de Belle Main, archbishop of Lyon, ordered them to refrain from preaching, and at the Council of Verona 1184 they were threatened with excommunication by Pope Lucius III., along with the Catharians and the followers of Arnold of Buscia; but though they had no desire to break with the Church they held on their way, and at length in 1215 at the Lateran Council the papal threat was put in execution. Notwithstanding, they continued to spread, and by the end of the 13th c. they were to be found in the north of France, in Italy, Spain, and Germany, being especially numerous in Piedmont and Lombardy. As the action of the Church grew more hostile their creed took a more heretical form. The denial of purgatory and opposition to the clerical monopoly of the right to preach were its most striking features, both due, it is to be noted, to the *moral* rather than the *doctrinal* character of the movement. At length the extreme members began to regard the Church of Rome as the church of the Evil One, and themselves as the real Church of Christ. In 1477 Sixtus IV. preached a crusade against them in their headquarters in Savoy, in 1541 François I. ordered them to be rooted out in Piedmont, and in 1560 the Duke of Savoy led against them an army of 7000 men. A new persecution was commenced in 1655 by Charles Immanuel, and the 'bones of the slaughtered saints were scattered on the Alpine mountains cold;' but the voice of Protestant Europe, and most effectually the voice of the most imperative Protestant Cromwell, was raised in their defence, and a convention was concluded in their favour. On the revocation of the Edict of Nantes Louis XIV. compelled them either to emigrate or conform; but in 1689, when William of Orange became King of England, a large body ventured to return to Savoy. Straightway attacked by the French and the Piedmontese, they were able to keep their enemies at bay till the Piedmontese, having broken with the French, agreed to grant them an amnesty. But it was not till 1848 that they received from the King of Sardinia the same civil and religious rights as his Roman Catholic subjects. At the present time the W. inhabit the Val Martino, the Val Angrona, and the Val Lucerna, which lie about 27 miles S.W. of Turin, and are traversed by the headwaters of the Po. They number about 25,000, have 40 congregations, and maintain, according to the report of 1875-76, 16 mission stations. The liberty of preaching, which was formerly enjoyed by both men and women, was placed under restrictions by the new constitution of 1839. See Sir Samuel Morland (Cromwell's envoy), *History of the Evangelical Churches in the Valleys of Piedmont* (Lond. 1658); Faber, *Theology of the Ancient Vallenses* (Lond. 1838); Weiss, *Die Kirchenverfassung der Waldenser* (Zür. 1844); Henderson, *Observations on the Vaudois Church* (Lond. 1844); Baird, *History of the W.* (Lond. 1846); Monastier, *Histoire de l'Église Vaudoise* (Toul. 1847; Eng. trans. Lond. 1848); Bender, *Geschichte der Waldenser* (Ulm 1850); Muston, *L'Israel des Alpes* (4 vols. Par. 1851; Eng. trans. new ed. 1863); Dieckhoff, *Die Waldenser im Mittelalter* (Gött. 1851); Williams, *The Waldensian Church* (Lond. 1854); Herzog, *Die romanischen Waldenser* (Halle 1853); Lechler, *Studien und Kritiken* (1855); Wylie, *Valleys of the W.* (Lond. 1858); Palacky, *Die Beziehungen der Waldenser zu der ehemal, Sekte in Böhmen* (Prague, 1869); Melia, *Origin of the W.* (Lond. 1870); Lechler, *Joh. von Wiclif* (Leip. 1873, vol. i.); and Preger, *Beiträge zur Geschichte der Waldenser* (Mün. 1875).

Wales. See ENGLAND AND WALES.

Wales, Albert Edward, Prince of, eldest son of Her Majesty Queen Victoria, and heir-apparent to the British throne, was born at Buckingham Palace, 9th November 1841. After a careful education under four private tutors, he spent a session at the University of Edinburgh, a year at Oxford, and another at Cambridge, and in 1860 made a tour through Canada and the United States, which over, he joined the Curragh Camp, having been gazetted colonel in 1858. In 1862 he travelled with Dean

Stanley in the East, and on 10th March 1863 he married the Princess Alexandra (born 1st December 1844), eldest daughter of the reigning King of Denmark, Christian IX., by whom he has issue, two sons and three daughters, the eldest, Prince Albert Edward Victor Christian (born 8th January 1864). His recovery from a six weeks' attack of typhoid fever was celebrated by a Thanksgiving Service in St. Paul's, attended by 13,000 persons, 27th February 1872; and that loyalty is not confined to England was abundantly proved during the Prince's visit to India (October 1875–May 1876), whose events are chronicled in Dr. Russell's *Tour of the P. of W. in India* (Lond. 1877). In 1878 he was re-elected to the Grand-Mastership of the Freemasons, a dignity conferred three years before, and in October of the same year he received an address bearing 1000 signatures, 'thanking him for his great exertions in connection with the Paris Exhibition.' For his various titles see PRINCE OF WALES.

Wales, New South. See NEW SOUTH WALES.

Wal'fisch Bay is situated on the S.W. coast of Africa, in 22° 50′ S. lat. It possesses safe anchorage, but is without fresh water, and its shores are barren and desolate in the extreme. Fish are very abundant, and it was formerly a favourite whaling-ground, whence its name. Valuable deposits of copper and lead exist some distance inland, but are not yet worked. The climate of W. B. is almost rainless, and is fairly healthy except in the hot months, when low fever prevails. In 1878 the coast-line between the Cunene and Orange rivers, a distance of 720 miles, was annexed to Cape Colony, the British flag being hoisted at W. B. The strip of land thus taken possession of is from 13 to 18 miles broad.

Walhall'a. See VALHALLA.

Walk'er, Frederick, an English artist, was born in Marylebone, 24th May 1840, studied at the British Museum and at 'Leigh's,' and by the time he entered the Academy (1858) was earning a livelihood by designing wood-engravings. His beautiful drawings in *Once a Week* brought him into notice. Engaged by Thackeray to help him out with his illustrations for the novels, he was the 'F. W.' who gave to the crude designs of the humourist their charm of spirit, finish, and grace. He drew much for the Messrs. Dalziel Brothers, but with Miss Thackeray's *Village on the Cliff* ended his work for the engraver. He now devoted himself to painting, both in oil and water-colours. In the first his works were 'The Lost Path' (1863), 'Bathers' (1867), 'Vagrants' and 'In the Glen, Rathfarnham Park' (1868), 'The Old Gate' (1869), 'The Plough' (1870), 'At the Bar' (1871), and 'The Harbour of Refuge' (1872). His water-colours comprise 'Spring' (1863), 'The Bouquet' (1866), 'Fisherman and Boy' (1867), 'Streams in Inverness-shire' (1868), 'Wayfarers' (1870), 'Girl at a Stile' and 'The Housewife' (1871), 'The Escape' (1872), 'The Village' (1873), 'The Rainbow' (1874), and 'Fishmonger's Shop' (1875). Some of these are technical masterpieces, and all are alive with sentiment and meaning. The drawing is well-nigh perfect, the colour clear and delicate, and the prevailing tone that of the tenderest pathos, tinged with humour. In his love of beauty and in graceful inventiveness W. evinced the deep influence of the early study of the antique. He was made an associate of the Old Water-Colour Society in 1863, and a full member in 1866, and was elected an associate of the Royal Academy in 1871. He died at St. Fillan's, Perthshire, 4th June 1875. An exhibition of 150 of his works took place in 1876.

Walk'er, George, D.D., a clergyman famous in Irish history, was born about 1650 in county Tyrone, and educated at the University of Glasgow. When Londonderry was besieged by James and deserted by its governor, W. organised its defence, and by his eloquence and heroism succeeded in repulsing the assailants till the siege was raised. He received the thanks of the House of Commons, the degree of D.D. from Oxford, and the bishopric of Derry with £5000 from King William. His *True Account of the Siege of Londonderry* (Lond. 1689, Edin. 1698) was followed by *A Vindication* (Lond. 1689), and in the same year he published *A Sermon; being an Encouragement of Protestants.* W. was killed at the battle of the Boyne, July 1, 1690. In 1828 the city he had served erected a monument to his memory.

Walking-Leaf. See LEAF INSECT.

Walking-Stick Insects (*Phasmidæ*), a peculiar family of *Orthopterous* insects, so named from the resemblance of their bodies to dried twigs. They present good examples of the *Mimicry* (q. v.) of other objects by animal forms. The body is long and linear, and the wings are short and rudimentary. *Phasma* has antennæ nearly as long as the body, and there are wings in both sexes. *Phasma gigas* of the E. Indies exemplifies the group, and *Phasma guttatum* is a Bornean species.

Walking-Sticks are made from the branches of almost every conceivable tree and shrub; but the numerous varieties of cane and bamboo are the most suitable from their size and form, and therefore 'cane' and 'bamboo' W.-S. are to a large extent synonymous. The Malacca cane and the Penang Lawyer are the most highly prized. (See CANE and BAMBOO.) The hard and fancy woods are also largely utilised for the manufacture of W.-S., the better varieties being often ivory-handled and mounted in gold or silver ferrules. Sword-blades, stilettos, knives, cork-screws, tobacco-pipes, and like objects, are often fitted into the hollow upper end of W.-S.

Wall'ace, Sir William, the champion of Scottish independence, and, in popular belief, the noblest incarnation of patriotism recorded in history, was born in the second half of the 13th c. The immortal fable of Blind Harry (q. v.) forms part of the national creed, and is so universally known that it need not here be repeated in detail. To what family the hero belonged we can only conjecture from the name he bore; but of his antecedents previous to the revolt against the English domination in 1296–97 nothing is really known. It is not improbable, however, that the tradition which connects him with the contemporary Wallaces of Elderslie is correct. Its universality is in its favour. But no evidence of adequate antiquity exists to prove it. The oldest authorities are silent on the point. Wyntoun merely says, 'hys fadyre wes a manly knycht' (Bk. viii. chap. xiii.), and the genuine Fordun (see Skene's edition in the *Historians of Scotland*, vol. i. p. 328) is not more definite, though more detailed. It is not till we reach the distant age of Blind Harry—nearly two centuries later—that we learn anything of his family, or are furnished with any biography of the hero. Setting aside the prodigious fictions with which the rude minstrel envelops the youth of W., the first genuine glimpse we obtain of the patriot is in Lanark in the spring of 1297, when he surprised and slew the English governor, Hesilrig. This incident does not rest on the comparatively late authority of the Scottish chroniclers, though the testimony of Wyntoun in particular is not to be lightly esteemed. In the *Scalachronica* (p. 124) Sir Thomas de Grey, a Northumbrian knight, tells how his father was in garrison at Lanark in May 1297, when W. fell upon the English quarters, killed the governor, and set fire to the place. As Grey's father was severely wounded and left for dead in the street, he could scarcely be mistaken in the fact. This affray was probably the beginning of the national insurrection against the rule of the foreigner—a rule which the orders sent by Edward to Cressingham (see Hemingford and the *Fœdera*) show to have been singularly harsh and oppressive. Fordun's statement is: 'Ex eo igitur tempore congregati sunt ad eum omnes, qui erant in amaro animo, et oppressi pondere servitutis sub intolerabili principatu Anglicanæ dominationis, et factus est eorum dux.' From a guerilla chief, a captain of patriotic Adullamites, he rose to be a national leader: without almost any help from the nobles, he drove the English garrisons out of the larger part of Scotland, won a great battle at Stirling (August 1297) over Warenne Earl of Surrey, devastated the North of England in the following winter, and in July 1298 was utterly crushed at Falkirk by the overwhelming force of Edward I. He then vanishes from our sight, only to reappear at his capture near Glasgow and execution in London seven years afterwards (23d August 1305). This is substantially his whole biography. His public career embraces a period of no less than fifteen months; his private history is a blank.

The extraordinary fable that has superseded this meagre record, and that has infected with an absurd credulity almost the whole series of Scottish historians, is chiefly, though not wholly, the product of Blind Harry's barbarous imagination. Long before the minstrel was born, patriotic pride had been generously at work, after its vaunting fashion, to clothe the hero with every attribute of majesty and to celebrate his prowess with the splendid exaggerations of romance. Wyntoun tells us (Bk. viii. chap. 15) that, before even his time, 'gret gestis' had been made

about W., while the continuator and interpolator of Fordun exhausts his admiration and his Latin in the effort to describe the physique of the national champion: 'Erat enim statura procerus, corpore giganteus, facie serenus, vultu jocundus, humeris latus, ossibus grossus, ventre congruus, lateribus protelus, aspectu gratus sed visu ferus, renibus amplus, brachiis et cruribus vigorosus, pugil acerrimus, et omnibus artubus fortissimus et compactus.' It is not wonderful that with such grotesque enthusiasm to encourage him, Blind Harry should feel himself at liberty to conduct his hero through a brilliant succession of impossible exploits. That everything is fiction we do not require to believe. Blind Harry's poem teems with evidences of his topographical knowledge, but nothing is conceived and nothing is recorded in a historic spirit. The moment he passes beyond the narrow limit of ascertained facts, we are lost in an imbroglio of incredibilities, and even the facts themselves are perverted and distorted in the most ridiculous manner. The story of W.'s youth—which almost every Scot feels it a religious duty to believe—is utterly impossible. There were no English then in Scotland. To describe them, moreover, as the 'auld mortal faes' of that country is a ludicrous anachronism, yet it is assigned as one of the motives of W.'s implacable hatred of the Southrons. The battle of Stirling Bridge is a model of extravagant absurdity, but in order to realise the profundity of the minstrel's fiction it is necessary to carefully study the eighth canto of his poem. The contemporary English chronicler Hemingford states that W. burnt and devastated *totam Northumbriam usque Novum castrum.* But this petty retaliation does not satisfy the ambitious patriotism of the bard. The victorious Scots are carried south through Durham, York, and the midland counties as far as St. Albans. Edward, the first soldier in Europe, fleeing before them, and followed apparently by all the burgesses and peasantry in the land. Nor is this all. W. threatens to besiege the metropolis itself if the English king will not come out and fight him. Every one trembles at the approach of this new Goliath. No one has the courage to approach him and sue for peace, till the queen herself declares that she will undertake the perilous mission, whereupon Blind Harry's audacity culminates in the declaration that it was rumoured the queen was in love with the patriot chief. The result of the interview convinces her that the virtue of W. is as invincible as his prowess. To her prayers, her arguments, her blandishments he sternly turns a deaf ear; and she returns to London in dejection. By her advice Edward makes peace with the conqueror, and solemnly abjures every right of sovereignty over Scotland. How deeply this wild delusion, known as the History of W., took possession of the Scottish mind may be judged from the fact that a man like Dr. Jamieson (see the new edition of his *Blind Harry*, by Maurice Ogle, Glasgow, 1869) actually wrote to Mr. Henry Ellis of the British Museum, to ascertain if there was anything in the MSS. of that library to corroborate the story of the interview between the English queen and W. Few Scotchmen quite distinctly apprehend that the whole groundwork and conception of the minstrel's poem is fantastically erroneous, that he knew really nothing of the character or duration of the struggle, and that the vast majority of the incidents are the manifest offspring of unbounded credulity. The work in short is valueless for biographical purposes, a fact that need not be regretted, least of all by the countrymen of W. For there is much in *Blind Harry* to lessen our admiration of his hero. The author was familiar with the romances of chivalry to which he frequently alludes, and he borrows from their pages some of their worst peculiarities. He is more solicitous to present the patriot as unequalled in prowess than wise in council or humane in war; and while he cannot quite overlook the national struggle or forget that W. had a policy and fought for a purpose, his supreme delight is to turn aside from the conflict of hosts to the bloody details of private encounters, in which the sword of the invincible knight makes havoc of squadrons and inspires universal dismay. Nowhere does a gleam of civic virtue or sovereign statesmanship lighten the path of the warrior. Yet the only certain occurrence in his public career which in any way illustrates his public aims is his recently discovered letter to the corporations of Lübeck and Hamburg, inviting the merchants of these cities to resume their commercial intercourse with Scotland, which had apparently ceased during the confusions that followed the English Conquest.

The truth is, that while *Blind Harry* tells us nothing of W. that is worthy of belief, it throws a powerful light on the age of the minstrel himself. In its fierce and passionate verse we see the pernicious result of the desperate attempts of the English kings to overthrow the liberties of a proud and obdurate people. An intense hatred of England was the inevitable result of a hundred years of bloody and unprofitable strife. The animosities of the poem are those of the 15th and not of the 13th c. Blind Harry's vision of the Past is discoloured by the smoke and flame of the intervening period, when the slopes of the Cheviots continually re-echoed the shouts of a 'Douglas' or a 'Percy.' Yet though Scotchmen may be no longer willing or able to say with Burns that *Blind Harry* has poured a Scottish prejudice into their veins 'which will boil along there till the floodgates of life shut in eternal rest,' they may without challenge cherish a proud remembrance of the man who saw or felt that there was the making of a distinct and precious nationality in his countrymen, who refused to have it obliterated, fought with a heroic energy for its development, and breathed into the new community the breath of a sterner and more fervid life. See the older authors, Wyntoun, Fordun, and Blind Harry, the modern histories of Tytler and Hill Burton, the W. Papers, Carrick's *Life of Sir William W.*, and the slight but sensible paper of the Marquess of Bute on *Sir William W.* (Paisley 1876).

Wall'ace, Alfred Russell, an eminent English naturalist, was born, 8th January 1822, at Usk, in Monmouthshire, and received most of his education at Christ's Hospital, Hertford. At an early period he turned his attention to natural science. He has made two remarkable series of explorations—the first along with Mr. Bates from 1848 to 1852 in the valley of the Amazon, and the second independently from 1854 to 1862 in the E. Indian Archipelago. He has formulated a theory which in all its main features coincides with the natural selection of Mr. Darwin; and his observations and researches have done as much as those of any man living to assist in working out the problems associated with the theory. The natural history collections made during his travels were unusually rich. Most of those from the Amazon, as well as many of his manuscripts, were lost in the passage home; but he succeeded in bringing to England from the E. Indies about 125,000 specimens, including 100,000 insects and 8000 birds. His name has been given to a channel running between Lombok and Bali, which he has indicated as marking out the boundary between the Asiatic and the Australian region. In recent years W. has avowed himself an advocate of spiritualism convinced against his will. The following are his principal works—*Travels in the Amazon and Rio Negro* (Lond. 1853; new ed. 1870); *Palm Trees of the Amazon* (Lond. 1853); *The Malay Archipelago* (2 vols. Lond. 1869); *Contributions to the Theory of Natural Selection* (Lond. 1870), a collection of essays and papers from scientific periodicals; *Miracles and Modern Spiritualism* (Lond. 1875), a reprint of papers contributed to the *Fortnightly Review* (1874); *On the Geographical Distribution of Animals* (Lond. 1876), an elaborate survey of all ascertained facts on the subject, enriched by the results of much original research; and *Tropical Nature* (Lond. 1878), on the colours of natural objects, sexual selection, &c.

Wall'ace, William Vincent, an English composer, was born at Waterford, of Scotch parentage, June 1, 1814. His father, a regimental bandmaster, gave him his first lessons, and at an early age he could play most military instruments, besides becoming a proficient on the violin and pianoforte. At the age of fifteen he went to Dublin, where he became director of the Philharmonic Society. His health failing, he made a voyage to Australia, and after having recruited it he undertook a professional tour through the Antipodes, Oceania, India, S. America, and the United States, creating a furore in his dual capacity of composer and performer. He was director of music at the Italian Theatre, Mexico, in 1841-42. In 1846 he produced *Maritana* in London and Vienna, an opera which ran for 100 nights, and now shares with Balfe's *Bohemian Girl* the highest popularity of any native lyrical drama. *Matilda of Hungary* was also produced in this year at the same cities, and was followed by the *Maid of Zurich*, *Gulnare*, and *Olga*. He was commissioned to compose a work for the Grand Opera in Paris in 1849, but the temporary failing of his eyesight prevented his accepting this honour. His *Lurline*, produced in London in

1860, is one of his best operas, the score being a work of genius. *The Amber Witch* (1861), *Love's Triumph* (1862), and the *Desert Flower* (1863), were his last operatic efforts. He died at the Château de Bagen, in the Haute Garonne, France, October 12, 1865, leaving, in addition to his operas, a great number of nocturnes, waltzes, studies, songs, and compositions for the pianoforte. W. had a high intelligence, a fine flow of melody, a sound orchestral knowledge, was a man of culture and an admirable linguist. See his Memoirs in French by Pougin (Par. 1866).

Wall'ace, Robert, D.D., a Scottish theologian and journalist, was born in the parish of St. Andrews, Fifeshire, June 24, 1831, educated at Geddes Institution, Culross, the High School of Edinburgh; studied for the Church at the University of St. Andrews, where he graduated M.A. in 1853, and at Edinburgh. He was chosen minister of Newton-upon-Ayr (1857), translated to Trinity College Church, Edinburgh (1860), thence to Old Greyfriars' Church in the same city (1868), and appointed Professor of Church History in the University of Edinburgh (1872). He received from the University of Glasgow the degree of D.D. in 1869. At first intensely anxious to do his duty by the traditional theology of Scotland, W. seems to have been led, step by step, to abandon the assertion of its cardinal positions, until his intellectual attitude assumed the aspect of an apparently unqualified Rationalism. Yet so long as he found it possible to harmonise himself with his theological environments, he had both freedom and followers within the National Communion. His brilliant talent for debate, his humour, self-possession, force of intellect, and fulness of knowledge, made him popular even with his opponents, and many Churchmen felt an emotion of genuine grief when in 1876 he formally withdrew from the clerical profession. Since then W. has held the office of editor of the *Scotsman*, in succession to the late Alexander Russel.

Walla'chia. See RUMANIA.

Wall'enstein, properly **Waldstein, Albrecht Eusebius Wenzel von,** was born of noble but impoverished parents at Hermanic in Bohemia, 14th September 1583. An orphan at the age of twelve, he was entrusted to the care of the Bohemian Brethren at Kaschumberg, but four years later he joined the Jesuits at Olmütz. In 1559-60 he was at the Lutheran University of Altorf, and thereafter we find him studying in Padua, and travelling in Italy, Germany, and the Netherlands. He gained large estates by marriage with a rich widow, who died in 1614. With his own troops W. raised the siege of Gradisca by the Venetians, and was rewarded with the title of Graf, and the command of a regiment in Moravia. His marriage in 1617 to a relative of Graf Eggenberg, and his conduct during the Bohemian revolution, procured him the favour of the Emperor. He profited immensely in the confiscations after the rising, securing Friedland and Reichenberg in 1621 for 150,000 florins, and in 1622-24 estates to the value of 7,290,000 florins. Part of the money was covered by his own expenses, and part he paid with debased coin. He was made a Prince of the Empire in 1623, and Duke of Friedland in 1624. The preparations of Christian IV. forced Ferdinand in 1625 to accept W.'s proposal to levy 20,000 men at his own expense. Appointed commander-in-chief on the 25th July, W. raised a much larger force, occupied the diocese of Halberstadt in the autumn, and on the 25th April 1626 completely defeated Mansfeld at Dessau. Entering Schlesien in June 1627 with 30,000 men, he was in August joined at Lauenburg by Tilly and Duke Georg of Lüneburg, and by the close of the year had overrun Mecklenburg, Holstein, Slesvig, and Jutland. For this the Emperor made Friedland a hereditary duchy, gave W. (September 1, 1527) the Silesian dukedom of Sagan with Priebus, and made over to him the lands and titles of the two Dukes of Mecklenburg in 1629. As admiral of the Baltic and North Seas he undertook in 1628 to conquer Pommern, but was forced to retire from Stralsund after a costly siege of four months. His arrogance and the growing suspicion of his hidden designs made him many enemies at court, and his chief opponent there was the head of the League, the Elector of Bavaria. After the Edict of Restitution and the landing of Gustaf Adolf (q. v.) in Pommern, Ferdinand, finding the aid of the League necessary, was driven at the diet of Regensburg in 1630 to dismiss W., who at once retired to live in regal splendour on his estate at Gitchin. The success of the Swedes soon compelled Ferdinand to recall W., who with great difficulty was prevailed upon (April 1632) to levy an army of 50,000 men. The Edict of Restitution was recalled, and W. received unlimited power as generalissimo of the empire, Austria, and Spain, till the conclusion of peace. Quickly driving the Saxons from Bohemia, he pushed on to Nürnberg to clear Bavaria of the Swedes, and repulsed Gustaf Adolf at Fürth (August 24). Turning aside to Sachsen, he was decisively defeated by Gustaf Adolf at Lützen (q. v.). Executing the officers to whom he attributed his defeat, W. entered Schlesien in the spring of 1632. In June the Saxon Elector had almost concluded a treaty with W., who hoped now to establish a general peace, gaining the Palatinate for himself. Having cleared Schlesien of its Swedish garrisons, he checked the advance of Bernhard of Weimar by a dash at Regensburg, and returned in December to winter in Bohemia. The intriguing Spanish ambassador, Oñate, at length persuaded Ferdinand to dismiss W., and continue the war in alliance with Spain. In the beginning of February, Gallas, Aldringer, and Piccolomini were secretly won over to the court. On the 24th W. entered Eger. On the night of the 25th, Colonel Butler, with the Scotchmen Gordon and Leslie commanding there, having struck down the generals Ilow, Terska, and Kinsky at a banquet, an Irish captain, Devereux, assassinated W. in his bedroom. Of all the leaders of the Thirty Years' War, W. alone conceived a true idea of German unity. But his efforts to establish peace on a basis of religious liberty were frustrated by his devotion to a misguided emperor, and the delusive hope of founding stable institutions by military power. W. had faith only in himself and his science of astrology. 'Cassandra-like, he was wiser than all the world, and was trusted by none.' Schiller has enshrined in noble drama the memory of the 'last supremely able man of his time, whose life was spent in battling against the great evils of the land, the spirit of religious intolerance, and the spirit of division.' The chief work on W. is Ranke's *Geschichte W.'s* (Leip. 1869). See also the works cited under THIRTY YEARS' WAR.

Wall'er, Edmund, an English poet, born at Cobshill, Hertfordshire, March 2d, 1605, was the son of Robert W., and cousin of John Hampden, and thus a distant relative of Cromwell. He was educated at Eton and King's College, Cambridge, and when his father died in 1616, the year of Shakespeare's death, he was left with estates worth £3500. About his eighteenth year he obtained a seat in Parliament, and wrote his first extant poem, *On the Danger of His Majesty, escaped in the Road at St. Undens.* His first wife, Anna Banks, married in 1631, having died about four years after, the poet successively wooed in verse, and it may be supposed in prose, Lady Dorothy Sidney, whom he styled *Sacharissa*, and Lady Sophia Murray, whom he styled *Amoret*; but failed in both his suits. In 1640 he was selected by the House of Commons to support the impeachment of Justice Crawley for his advocacy of the obnoxious ship-money. In 1643 he was appointed one of the commissioners of the Parliament in the Oxford negotiations with the king, but before the year was out he was found concerned in a plot to seize the leading members, and after a year's imprisonment in the Tower, and the payment of a fine of £10,000, he had to leave the country. He was in Venice in 1646, in Rouen in 1647, and there married a French lady, Marie Bresse or Breaux. In 1653 he obtained permission to return to his native land; two years later he was addressing a *Panegyric to my Lord Protector.* Five years more, and he was equally ready with verses *To the King upon his most happy return*, but the verses were not quite so good as those to Cromwell, and when the king was quick enough to tease him with this inferiority, the poet was witty enough to make the famous excuse—'*Poets, sir, succeed but in fiction.*' He was a member of the king's first Parliament, May 1661, and occupied a similar position for many years after. His death took place at Beaconsfield, near which he had a house, at Hall Barn, October 1687. W.'s poems first appeared in 1645, in three separate editions; other five editions were published in his lifetime, and they have been frequently reprinted. His rank in English literature was for a time preposterously high: Atterbury spoke of him as the parent of English verse, and Hume as the first refiner of English poetry, at least of English rhyme. A few of his pieces are very polished and pretty, and a line of terse vigour or new-coined and brilliant metaphor now and then comes as a surprise. See the Life prefaced to Bell's edition of W.'s poems (new ed. Lond. 1871).

Wall'flower (*Cheiranthus*), a genus of long-podded *Cruciferæ*, familiarly represented by the garden favourite the gilly-

flower or common W. (*C. Chiari*). This plant is a native of central and southern Europe, and has long been naturalised in Britain. It is prized for its early flowering and its sweet fragrance. The wild plant bears bright-yellow or orange-yellow single blossoms, but by the gardener's skill double flowers, varying in colour through red, purple, and brown, have been obtained and are commonly current. There are 12 species of W. distributed through the temperate and cold regions of the N. hemisphere.

Wall'ingford ('the ford at the wall or fortification'), a market-town of Berkshire, England, 14½ miles N.W. of Reading by rail, on the right bank of the Thames, which is here spanned by a bridge (1809) 900 feet in length. Of its three churches, St. Leonard's is an old Norman edifice, St. Mary's was built from the materials of a castle (erected by Stephen 1146, and dismantled by the Parliament 1653), and St. Peter's was rebuilt (1769) by Sir William Blackstone, whose tomb it contains. W. carries on a considerable agricultural trade, and publishes one weekly newspaper. Pop. of parliamentary borough, which returns one member (1871) 8353; of municipal borough, 2972. A Roman station, W. gave its name to a treaty between Stephen and the future Henry II. (1153), and it was captured by Fairfax in the Great Rebellion, since which period it has dwindled in importance.

Wall'is, John, D.D., F.R.S., an English mathematician and divine, was born November 23, 1616, at Ashford in Kent. He entered Emmanuel College, Cambridge, at sixteen, and after graduation was elected a Fellow of Queen's in 1640. During the Civil War he was of great service to the parliament in deciphering secret correspondence. In 1644 he became secretary to the Westminster Assembly, holding at the same time the living of St. Gabriel, Fenchurch Street. About 1647 he turned his attention to mathematics, and was appointed Savilian Professor of Geometry at Oxford in 1648. In 1655 he published his *Arithmetica Infinitorum*, and the next year became involved in a controversy with Hobbes regarding a quadrature of the circle. He wrote numerous other mathematical works on proportion, mechanics, &c., besides re-editing part of the works of Horrocks, Archimedes, Ptolemy, Aristarchus, and Pappus. These were collected and published in 3 vols. (1699). W. was also author of an English grammar written in Latin (1653), a treatise on logic (1687), and various theological works. He died at Oxford, October 28, 1703. His fame rests upon his *Arithmetica Infinitorum*, in which he displays a singular faculty for summing infinite series. Of this nature is his famous value for π, namely,

$$\frac{\pi}{4} = \frac{2 \cdot 4 \cdot 4 \cdot 6 \cdot 6 \cdot 8 \cdot 8 \cdot 10 \cdot \ldots\ldots}{3 \cdot 3 \cdot 5 \cdot 5 \cdot 7 \cdot 7 \cdot 9 \cdot 9 \cdot \ldots\ldots} \text{ to infinity.}$$

A biography of W. is prefixed to the collected edition of his sermons published in 1791.

Walloons', the descendants of the old Gallic Belgæ mixed with Romanic elements, occupying the extreme north-eastern territory of the *langue d'oïl*, viz., the Belgian provinces of Hainault, Liège, and Namur, Southern Brabant, Western Luxembourg, and a few villages round Malmedy in Rhenish Prussia. In Belgium their number is estimated at 2,250,000. Livelier than their Flemish, more hardy and industrious than their French neighbours, the W. make excellent soldiers, and have produced one famous general, Tilly. Their dialect, termed *lingua Wallonica* as early as 1136, has retained more Celtic elements than French, from which it is further distinguished by its copious borrowings from Low German (*e.g.*, of the letters *k* and *w*) and by such phonetic changes as the apocope of *ll* and *gn*, in *coy* = *cueillir*, and *champion* = *champignon*. Its scanty literature dates from the beginning of the 18th c., the earliest drama being *Si Ligeoi egagi* (1757) of J. J. Fabry, prior to which Rickman had published a satire on watering-places, *Les Aiw di Tonk*. See Simonon, *Pöesies en Patois de Liège* (Li. 1845); Grandgagnage, *Dictionnaire Etymologique de la Langue Wallonne* (2 vols. Li. 1845–51), Van der Kindere, *Recherches de l'Ethnologie de la Belgique* (Bruss. 1872).

Walls'end, a village of Northumberland, England, 4 miles E.N.E. of Newcastle by rail, on the left bank of the Tyne, was so called from its position at the eastern extremity of the Roman Wall, and itself gave name to a variety of coal raised from a colliery which was opened in 1777. Now, however, 'W. coal' is applied to all coal passed through a five-eighth inch sieve. W. has a parish church (1809), four chapels, and a temperance hall. Pop. (1871) 4100.

Wall-Trees, in horticulture, are fruit-trees trained against the surface of walls, thereby securing to them an increase of temperature and protection from high winds. The materials of the walls may be brick, stone, earth, concrete, or wood, but the first is by far the best, retaining more warmth than the others, and giving numerous joints for holding the fastenings of the W.-T. Twelve feet is a convenient height for the wall, though for pears and vines it may be half as much again if desirable. The different modes of training W.-T. may be reduced to three forms or systems—the fan or palmate form, which is the most natural mode and that most generally applicable; the horizontal system, which is adapted to trees with strong stems and of long duration; and the perpendicular system, which is chiefly adapted to climbers, such as the vine. Wall-training renders the fruit-trees more prolific, improves the quality of the fruit, permits the production of fruit in the open air which otherwise could only be obtained under glass, and confines the trees within a limited space.

Wal'nut (Old Eng. *wealh-hnut*, 'the foreign nut') is both the tree-name and the name of the fruit of the *Juglans regia* of botanists, and has been popularly extended to comprise all the species of this important genus of *Juglandaceæ*. The order is distinguished from its allies by having alternate, pinnate, often aromatic leaves, without stipules; monœcious flowers, the male congregated into catkins, and the female solitary; an inferior 1-celled ovary furnishing at maturity one oily seed destitute of albumen. It consists of five genera, of which *Juglans* is the most important; and of its constituents the common W. is the best known and most valuable. This species is a long-lived large tree with velvety young shoots, has imparipinnate leaves of 3–6 pair of eliptic-oblong leaflets; the male catkins are cylindric and 2–5 inches long, the individual flowers having 6 perianth lobes and 10–20 stamens; female flowers 1–3; fruit green, ovoid, glabrous, 2 inches long, enclosing a brown irregularly-furrowed nut which is 2-valved, divided by 2 thin coriaceous dissepiments into 4 incomplete cells. As a timber-tree the heart-wood is very durable, works well, and does not split or warp; it takes a fine polish, and is a beautiful furniture wood. Its principal use is for furniture and gun-stocks; it is also employed for turning and fancy articles. The bark possesses dyeing and tanning properties. But the most important product of the tree is its fruit, which forms a favourite item of dessert, and in the young state makes a very good pickle. The husk yields a dark-brown dye. In France an oil is expressed from the kernel serving as an article of diet and used in the preparation of fine colours. The W. is wild in many forests of N.W. Himalaya and in Sikkim, in trans-Caucasia, and probably in Armenia. In Western Europe it is grown nearly to 58° N. lat. (in Ross-shire), but only in sheltered places. Near Edinburgh the tree grows with vigour, but ripens its fruit only in the finest and hottest summers. On the E. side of Europe it is found to 52°. The tree was known to the ancients, and Pliny states that it was brought from Persia. Other noteworthy species of *Juglans* are the black W.-tree (*J. nigra*) and the Butternut-tree (*J. cinerea*) —both forest-trees of N. America. The first attains a height of 70 feet, has a strong, tough, purplish-brown wood, which for its compactness, durability, and its susceptibility to high polish, is much sought for as a furniture wood, and has been largely used of late for gun-stocks. The second is a smaller tree, and its wood is lighter than the black W., but it is equally durable, is not liable to split, is not liable to the attacks of insects, and is in much demand for panels of carriages, corn-shovels, wood dishes, &c. The leaves, bark, and husk are used for medicinal purposes.

Wal'pole, Sir Robert, an English statesman, was born at Houghton in Norfolk, August 26, 1676, and educated at Eton and King's College, Cambridge. On entering Parliament he attached himself to the Whig party, and was successively appointed a member of the Council of the Admiralty (1705), Secretary of War (1708), and Treasurer of the Navy (1709). His defence of the financial policy of the fallen Godolphin aroused the enmity of the Tories, and on a charge of corruption he was expelled from the House of Commons, and imprisoned for some months in the Tower (January 17, 1712). The borough of King's Lynn, however, returned him to Parliament in 1714, and not long afterwards his known zeal for the Hanoverian succession procured him rapid promotion under the new king, George II. In 1715 he became First Lord of the Treasury and Chancellor of the Exchequer; but in 1717, on a division in the

cabinet, he resigned. The disastrous effects of the South-Sea Scheme having rendered his financial services of prime importance to the nation, he returned to power in 1721, and for the next twenty-one years, in spite of a powerful, persistent, and versatile opposition, he kept his seat at the head of the Government, crushing all insubordination among the members of his cabinet, and venturing at times to go in the teeth of the popular will. At length in 1742 he resigned office, accepted the earldom of Oxford and a pension of £4000, and retired into private life. He died in 1745. W.'s political character has been very variously judged, but no one can venture to deny him the possession of high capacity and skill, especially in matters of finance. He was ambitious and fond of power, showed little delicacy in the acquisition of wealth, and acted very consistently on the maxim that a price may be found for any man and any woman. But even his political opponents admit that the charges of corruption brought against him were in great part falsehood, and in great part exaggeration. It was mainly by him that England was saved from a disputed succession; it was almost solely to him that she was indebted for the long peace which allowed her commerce and industries to develop; he began to reduce the national debt; he encouraged the commerce of the colonies, and he laid the basis of free trade. See Coxe's *Life of Robert W.* (3d ed. 1816, 4 vols.); *Walpoliana* (privately printed by Lord Hardwicke in 1783); Mahon's *History of England*, 1713–83 (5th ed. Lond. 1858); Ewald's *Sir Robert W., a Political Biography* (Lond. 1877); Lecky's *History of England in the Eighteenth Century* (Lond. 1878); Macaulay's *Essay on Horace W.'s Letters*; and Carlyle's *Life of Frederick the Great*.—**Horace W.**, generally believed to be the third son of Sir Robert W., was born October 5, 1717, and received his education at Eton and Cambridge. Along with his old schoolfellow Gray, he spent the greater part of two years on the grand tour, and on his return home in 1741 he entered Parliament. But though he kept his seat, now for one borough and now for another, as late as 1768, he took almost no part in the business of the House; and indeed after 1747, when he purchased a small estate near Twickenham, he devoted the greater part of his attention to the extension and improvement of his 'rural bijou,' which was gradually transformed into a fantastic Gothic castle—the well-known Strawberry Hill. In 1757 he started a printing-press. Gray's two odes were the first productions of his press; and in 1758 he issued his own *Catalogue of Royal and Noble Authors*. During the latter part of his life he felt a great attraction to Paris. He was there in 1765, in 1767, in 1769, and in 1775; and on the second occasion he formed a warm friendship for Madame Du Deffand, '*who loves* me as much as my mother did.' The death of his nephew, the third Earl of Oxford, in 1791, gave him possession of his father's estate and titles; but he only survived to enjoy them for six years, dying on the 2d of March 1797. W.'s *Letters* rank him among the finest letter-writers in the English language; his *Castle of Otranto* was one of the earliest novels of the Romantic school; and his *Anecdotes of Painting in England* (based, however, on George Vertue's collections), formed for a time the best work on the subject. *Letters to George Montague*, 1736–70, were published (Lond. 1818); *Letters to Rev. William Cole, &c.*, 1745–82 (Lond. 1818); *Private Correspondence*, 1735–97 (1820, 4 vols.); *Letters to Horace Mann*, 1741–60 (1833, 3 vols.); and *Letters to H. Mann*, 1760–85 (1843–44, 4 vols.). *Letters to the Countess of Ossory* appeared in 1848, and *The Correspondence with Mason* in 1850; and finally a collected edition of all the letters, arranged chronologically, was published by Peter Cunningham (1857–58, 9 vols.). Among W.'s other works are *Historic Doubts in Life and Reign of King Richard III.* (1768); *Memoirs of the Last Ten Years of the Reign of George II.* (1822, 2 vols.); *Memoirs of King George III.* (1845, 4 vols.). See Warburton, *Memoirs of Horace W., &c.*, (Lond. 1851, 2 vols.); Macaulay, *Essay on Letters of Horace W.*; *Lettres de la Marquise du Deffand à Horace W.* (Par. 1864, 2 vols).

Walpur'gis (*Walburg*, 'shielder of the fallen,' *cf.* VALKYRJUR), **Saint**, sister of St. Willibald, died in 779, abbess of Heidenheim near Eichstädt. The day of her canonization (May 1) chancing to fall on that of one of the chief heathen festivals, the feast of spring, the *Walpurgisnacht* (between April 30 and May 1) came to be superstitiously regarded as the night when the witches danced with the devil on the Blocksberg.

Wal'rus. See MORSE.

Wal'sall, a town of Staffordshire, 8 miles N.N.W. of Birmingham by rail. It is situated on a small affluent of the Tame, and has good public buildings, including a Guildhall (1867), an Agricultural Hall (1868), a new church of St. George, erected 1875 at a cost of £7000, and a Cottage Hospital, opened in 1878. The special manufactures are saddlers' ironmongery and all kinds of leather goods (saddles, harness, &c.), the latter being largely exported to America and the colonies. There is much tanning, currying, bridle-cutting, and making of coachbuilders' furniture and fancy leather wares. W. lies on the margin of the S. Staffordshire mineral field, and produces a great variety of hardware, small castings, gas tubes, chandeliers, iron bedsteads, silver and brass plating, &c. Coal and lime are wrought in the vicinity. W. sends one member to Parliament, and publishes three newspapers. Pop. (1871) 49,018.

Wal'singham, Little, a village of Norfolk, England, 38¾ miles N.W. of Norwich by rail, has the ruins of an Augustinian priory, founded under the Conqueror by Geoffroy de Favarches. Its shrine of Our Lady of W. well-nigh outrivalled that of St. Thomas of Canterbury for popularity, and among the pilgrims who flocked to it were Henry VIII. and Erasmus. See the latter's *Peregrinatio Religionis ergo*, and the Introduction to Nichols' translation (2d ed. Lond. 1875).

Wal'singham, Sir Francis, was born of a good old Kentish stock at Chiselhurst, in 1536, and after finishing his course at King's College, Cambridge, became by foreign travel the finest linguist of his times. Cecil bred him his agent, and in 1570 sent him upon an embassy to France, and so skilfully did he beguile the Duc d'Anjou, that at his return (1573) he was taken for one of the principal secretaries of state, knighted, and sworn of the Privy Council. In 1578 he was a commissioner for the settlement of the Netherlands; in 1581, the year that Monsieur was courting the Virgin Queen, he revisited France, 'there playing,' says Naunton, 'the very same part that Gondomar since did here;' and in 1583 he 'altered the government of Scotland as ambassador.' Scotland and France alike by praying for his recall acknowledged his abilities, but these were to be yet more signally displayed. By suffering Babington's Conspiracy (1586) to come to a head, by intercepting letters, and, after deciphering, forwarding them to Mary Stuart (q. v.), he compassed the death of that unhappy queen, for which singular loyalty to his mistress he was created a knight of the garter, chancellor of the duchy of Lancaster, and recorder of Colchester. His principal merit is that with all his lucrative posts he was not rich when he died at Barn Elms, 6th April 1590, leaving a daughter who was successively wife to Sir Philip Sidney, the Earl of Essex, and the fourth Earl of Clanricarde. The eulogists of W. dwell with such admiration on his motto, 'Tell a lie and find a truth,' on his fifty-three agents and eighteen spies, and on 'the seeds of division that he sowed as the fiend in the Gospel tares,' that they have few words left for his learning, his powers of discourse, and his devotion to Elizabeth. See Naunton's *Fragmenta Regalia* (Lond. 1641), and Froude's *History of England* (vols. vii.–xii.).

Wal'tham, a small town of Massachusetts, U.S., on the Charles River, about 9 miles W. of Boston, with which it is connected by rail. It has several churches, a public library, schools, &c., but is chiefly noted for its extensive manufacture of watches (see WATCH). Pop. (1878) 9065.

Wal'tham Abbey, a market-town of Essex, England, on the Lee, 14 miles N. of Shoreditch by rail. Of the cruciform Romanesque church of Holy Cross only the nave and lady chapel remain, but these (restored in 1860–75) sufficiently attest the former grandeur of a structure whose erection is variously ascribed to Harold (*e.g.* by Mr. Freeman) and Henry I., and which was probably the last resting-place of the first-named king. There are besides six chapels, four schools, a court-house, and police-station (1876), and on the Lee is a large government factory of gunpowder and saltpetre. Pop. (1871) 5197. See, for the history of the Abbey Church, Prof. Stubbs' Introduction to his edition of the tract *De Inventione Sanctæ Crucis in Monte Acuto et de Deductione ejusdem apud Waltham* (Oxf. 1860).

Walther von der Vogelweide, was born of poor but noble parents between 1157 and 1167, probably in S. Tyrol. He lived first at the court of Friedrich of Austria, on whose death in 1198 he joined the party of Philipp of Hohenstaufen. He was present

at Philipp's coronation at Mainz, and thereafter stayed sometime with Hermann, Landgraf of Thüringen. After Philipp's assassination W. attached himself to Friedrich II., whom he accompanied to Palestine in 1228. W. was the greatest German lyrist of the Middle Ages, equally eminent in *Minnelied* and patriotic song. The chief editions of his poems are by Lachmann (4th ed. 1864), Wackernagel and Rieger (1862), and Pfeiffer (5th ed. 1877). See Gosse, *Northern Studies* (1879).

Wal'ton, Brian, born in 1600 at Seymour in Cleveland, Yorkshire, studied at Magdalen College and Peterhouse, Cambridge, and after graduating (1619) kept school in Suffolk. He became rector of St. Martin's Ongar, London, and Sandon in Essex (1635), chaplain to the king and a prebendary of St. Paul's (1639), but was sequestered from all these offices by the Parliament in 1642, having rendered himself obnoxious to the Puritans by his *Treatise on the Payment of Tithes and Oblations in London* (1641). Taking refuge in Oxford, he there designed the famous Polyglot (q. v.) that bears his name, and which in spite of infinite disturbances for his loyalty he completed in four years' time. At the Restoration he was rewarded with the bishopric of Chester, but died in London, 29th November 1661. His works, which include an *Introductio ad Lectionem Linguarum Orientalium* (1655), and an answer to Owen's *Vindication of the Purity of the Hebrew and Greek Texts* (1658), are enumerated in Todd's *Memoirs of W.'s Life and Writings* (2 vols. 1821).

Wal'ton, Izaak, was born at Stafford, August 9, 1593. About 1623 we find him carrying on business on his own account as a sempster or man-milliner in London, and having by 1643 acquired a competency, he retired to the quiet enjoyment of country life. His first wife, Rachel Floud, great grand-niece of Archbishop Cranmer, having died in 1640, he married about seven years later Ann Ken, whose brother, at that time a mere boy, afterwards became the famous bishop. In London W. had become intimate with Dr. Donne, Dr. Wharton, and Sir Henry Wotton, and in his later years he enjoyed the hospitality of many eminent clergymen of the Church of England. He died at Winchester, 15th December 1683. W.'s fame is mainly based on his *Compleat Angler; or the Contemplative Man's Companion*, which was first published in 1653 and appeared in a considerably modified form in 1655. Few more popular books exist in English, and the editions are consequently numerous. It is sufficient to mention those of Dr. Hawkins (1760) and Sir N. H. Nicholas (1833), and the *fac simile* reprint of the first edition, published by Elliot Stock in 1870. Full bibliographical detail will be found in Thomas Westwood's *Chronicle of the Compleat Angler* (Lond. 1864). W.'s natural history is frequently of the crudest and most credulous kind; his practical precepts are open to correction at the hands of the modern proficient; he possesses only a partial mastery over the difficult literary form (that of the dialogue) in which his work is cast; his style is remarkable neither for rugged strength nor polished precision; but he has succeeded in catching the spirit both of the gentle craft and the pleasant English scenery in which he had learned its delights. On the publication of Dr. Donne's *Sermons* W. supplied a Life of the author, and he afterwards wrote similar lives of Wotton, Hooker (1665), Herbert (1670), and Sanderson (1678). Among the complete editions of these lives, which are characterised by much the same features as the *Compleat Angler*, the most important are Dr. Thomas Zonch's (York 1796), Major's, with plates (Lond. 1825), and Washbourne's (Lond. 1857). A monument to W. was placed in St. Mary's, Stafford (the church of his baptism), in 1878. W.'s own Life has been written by Hawkins, Sir N. H. Nicholas, and W. Dowling. See also Shepherd's *Waltoniana: Inedited Remains* (Lond. 1879).

Waltz (Ger.; Fr. *valse*), the most popular and fashionable of round dances. It is in three-fourth time, and is performed by a couple who turn incessantly round and at the same time make a circuit of the room. From Bohemia it became the national dance of Germany, whence it was introduced into France about 1790. The French, however, claim a Provençal dance called the *volta* as the original of the W. Be this as it may, notwithstanding the popularity of the dance all over the world, Germany is still its peculiar home. The finest W. music is German: the great composers Beethoven and Weber have not disdained to embellish it with their genius, while the most rhythmical, elegant, and seductive of modern dance music is to be found in the strains of Strauss, Gung'l, and other musicians of the Fatherland. The W. is frequently set to words, and forms a favourite theme in operas. In dancing the valse a *trois temps* is most used.

Wam'pum, the N. American Indian name for shells or shell-beads used as currency. They are sometimes strung together and worn as a belt for ornament.

Wanderoo' Monkey (*Silenus veter*), a species of *Catarhine* or Old-World monkey, occurring in the E. Indies and Ceylon, and distinguished by the well-developed hairy covering of the head and neck, while the sides of the head and chin are also bearded. The tail is of moderate length and tufted. The colour of the fur is a deep or jet black, and the callosities on the buttocks are a bright pink. The length of the W. is about 3 feet. In some respects this monkey is regarded as relating the Macaque, with which it is usually classified, to the Baboon.

Wan'dewash, a town in the district of S. Arcot, Madras Presidency, British India, 73 miles S.W. of Madras, famous for the victory gained in December 1759 by the British under Colonel Eyre Coote over the French under Lally and Bussy. It led to the capture of Pondicherry, and was the decisive battle which established the supremacy of the British in the Carnatic, after an almost continuous war of fifteen years. In 1781, W. was heroically and successfully defended against Hyder Ali.

Wan'tage, a market-town of Berkshire, England, in the Vale of the White Horse, 10 miles S.W. of Abingdon, is connected by a steam tramway (1875), the first in England, with a Great Western station at W. Road, 2½ miles distant. It has a cruciform Second Pointed church (elaborately restored, 1857; enlarged, 1878), a corn exchange (1865), an Anglican house of mercy, a grammar-school (1850; enlarged 1877), &c. The Vale of White Horse Foundry is the only important manufactory of W., which has published since 1875 one weekly newspaper. Pop. (1871) 3295. At W., in 849, Ælfred the Great was born, and on July 14, 1877, a statue of him, of Sicilian marble, 8 feet high, and mounted upon a granite pedestal, was unveiled by the Prince of Wales in W. market-place.

Wap'enshaw ('weapon show'), in Scotland, a semi-military gathering enforced by various statutes during the 15th and 16th centuries. These directed that individuals should carry certain arms, according to their rank and property, and that they should, when summoned by sheriff or magistrate, rally round the king in time of war. On account of the merrymaking with which in later times wapenshaws became associated, they were discouraged by the Covenanters.

Wap'entake (Old Eng. *wæpen*, 'weapon,' and *tac*, 'touch'), a territorial designation in Yorkshire, corresponding to the *hundreds* of the southern counties, and to the more northern *wards*. It refers to the defensive military organisation of the Danish intruders, as distinguished from the more peaceful Hundred (q. v.).

Wap'iti (*Cervus Canadensis*), a typical and elegant species of deer, often named the Carolina stag, and found in N. America; where it is also popularly known as the 'Elk.' The adult W. may measure 5 feet in height at the shoulders, and attains a length of over 7 feet. The colour resembles that of the ordinary British deer, but the fur grows darker. The W. lives in large herds, and the antlers resemble those of the Stag (q. v.). The flesh is dry, but the hide furnishes a durable leather.

War, in its international sense, is a military contest between the armed forces of two or more states or nations; in its civil sense, a conflict between parties of the same state. International wars usually arise from disputes about territorial possessions and frontiers, unjust dealings with the subjects of one state by another, sympathy with struggles for liberty by persecuted nations, questions of race and sentiment, jealousy of military prestige, or desire of conquest. Civil W. is waged for political, religious, or social objects. W., though a great curse, seems in some cases an absolute necessity; and while human passions rage and human sufferings exist, it were vain to look for a cessation of its horrors. The country that sets its face absolutely and in all cases against it must expect to lose its position among the nations of the world, while that which needlessly rushes into its desperate meshes brings untold evil upon its people. A state of preparedness for W. is often the greatest security for peace, or at any rate is regarded as such, and hence arise the colossal standing

armies of the Continent, with their stern laws of military service. Wars are aggressive on the part of a state beginning hostilities with a hitherto friendly power, defensive on the part of a state which repels such aggression. Before the commencement of hostilities among civilised nations, the state taking the initiatory step issues a Declaration of W., which usually takes the form of an explanatory manifesto to neutral powers. The great aim in W. is the destruction of the enemy's military power, thus compelling him to sue for peace, upon the conclusion of which adequate securities are usually taken that the defeat shall be complete and effective against any fresh outbreak. In the prosecution of W. the fundamental principle is the bringing of the strongest possible force upon the weakest point of the enemy, and the using of such force with the greatest possible velocity. See ARMY, ARTILLERY, STRATEGY, TACTICS, &c. The end aimed at is often the possession of the enemy's capital, which by forcing the sovereign and legislature away from the centre of the state, paralyses trade and government, and must, if undefeated, compel the enemy to come to terms. The advantage in W., other things being equal, lies with the army strong enough to take the initiative, and to make the enemy's movements dependent on its own. The influence of modern science and appliances upon wars has been to shorten their duration, none of the four great European wars since the conflict in the Crimea having lasted a year. The loss of life has not, however, diminished in proportion, and the prosecution of a W. has become much more costly. Thus the civil war in America from 1861 to 1865 cost £800,000,000, or four times as much as 13 years of W. cost France under the First Empire.

The laws of war among civilised states permit the destruction or capture of armed enemies, the destruction of property likely to be of service to them, the stoppage of all their channels of traffic, and the appropriation of everything in an enemy's country necessary for the support and subsistence of the invading army. A victorious army seizes all public money and public property. Deserters from an army or enemies who have broken their parole are shot. Captured spies are hung. It is lawful to starve an enemy into surrender. But as far as possible wars are conducted with respect to the feelings of humanity and mercy. Wounding, except in battle, mutilation, and all cruel and wanton devastation, are illegal. All pillage and maltreatment of unarmed enemies is prohibited, but if such enemies rise against an army in possession, they violate the laws of war. The subjects of enemies cannot be forced into the service of victors, and their private property must be respected, although it may be temporarily appropriated for military purposes. All wounded prisoners should have medical treatment, and no punishment is due to a public enemy after his capture unless for crimes previously perpetrated against his capturers, violators of the laws of W. not being entitled to their protection. The use of the enemy's national flag is such a violation. The person of the bearer of a flag of truce is sacred, but firing is not required to stop on the appearance of a flag of truce during a battle. Hospitals are usually protected by special flags, and deception by designating other places in this way is considered infamous.

In naval warfare, ships of war are used for transport and blockade, for holding certain strategical positions, and for destroying the naval resources and armaments of the enemy. Shelling an unprotected town, and privateering, are considered illegal.

War'asdin, a frontier town in the comitat of W. Croatia, Austria, on the Drave, 28 miles N.E. of Agram. It has nine Catholic churches, a collegiate chapter, two monasteries, an upper gymnasium, and an old chateau. Its S. side is defended by redoubts. W. manufactures tobacco, stoneware, rosoglio, and silk. Pop (1870) 10,623.

War'beck. See PERKIN WARBECK.

War'bler (*Sylviadæ*), a very large family of *Dentirostral* birds, in modern systems of ornithological classification divided into a great number of subordinate groups. Some authorities have entirely discarded this family as too general for scientific arrangement. The typical genus *Sylvia* has a few weak bristles at the base of the bill, and the nostrils in a short groove. The first quill is short, and the third and fourth quills are the longest. The hinder toe has a strong claw. The sub-family *Luscininæ* may be regarded as including most of the species and genera formerly included in the family *Sylviadæ*. The best-known species are the Whitethroats, the Garden W., Willow W., Wood W., and Blackcap W. The Grasshopper W. (*Calamodyta locustella*) belongs to a different genus of W. from the preceding; and the Sedge W. (*C. phragmitis*) is a second species of the genus *Calamodyta*. The genus *Salicaria* includes the Fantail W. (*S. cisticola*) found on the Mediterranean coasts.

War'burton, William, D.D., an English divine, the son of an attorney, was born at Newark, December 24, 1698. On leaving school (1714) he was articled to his father's profession, and in due course having been admitted at one of the courts of Westminster he began to practise at Newark. At the end of four years, however, he determined to enter the church, and he was accordingly ordained deacon in 1723 and priest in 1727. His first publication was *Translations in Prose and Verse from Roman Poets, Orators, and Historians* (1724). The vicarage of Greaseley (1727), the rectory of Brant-Broughton (1728), the chaplaincy to the Prince of Wales (1738), a prebend of Gloucester (1753), a prebend of Durham (1755), and the deanery of Bristol (1757), were the principal steps of preferment which at length, in 1760, brought him to the bishopric of Gloucester. In the meantime he had gradually taken rank as one of the greatest theological writers of his time, and by sheer force of colossal self-assertion had attained to a kind of despotic supremacy. His principal work is an unfinished treatise on the *Divine Legation of Moses*, of which books i., ii., and iii. appeared in January 1737-38, and books iv., v., and vi. in 1741, while the vii. and viii. were probably never written and the ix. found only posthumous publication. The main argument is a worthless paradox: a belief in future retribution is necessary for the maintenance of all human society; the Jews had no knowledge of a future state; therefore the national existence of the Jews can only be explained on the hypothesis that they received supernatural support; and therefore the legation of Moses is divine. Around this cardinal paradox is collected an amazing mass of lesser paradox and erudition, while many incidental subjects are treated with great originality. Besides the *Divine Legation* his most important works are a *Critical and Philosophical Inquiry into the Causes of Prodigies and Miracles* (1728), and *The Alliance between Church and State* (1736). When in 1738 M. de Crousaz accused Pope of giving currency to infidel doctrines in his *Essay on Man*, W. published seven letters in the poet's defence (*A Vindication*, &c.), and the friendship thus established between the theologian and his protégé proved of great importance to both. A collected edition of W.'s works (7 vols. 1788) was brought out by his friend and henchman Bishop Hurd, and a supplemental volume appeared as a *Discourse by way of Preface* in 1794. A new edition in 12 vols. was published in 1811. See, besides the panegyrical account by Hurd (*u. s.*), J. S. Watson's *Life of W. W.* (Lond. 1863), Isaac Disraeli's *Calamities and Quarrels of Authors* (new ed. 1865), Hunt's *Religious Thought in England* (Lond. 1873), and Leslie Stephen's *English Thought in the Eighteenth Century* (Lond. 1876).

Ward, Artemus. See BROWNE, CHARLES FOSTER.

Ward, Edward Matthew, R.A., an English historical painter, was born at Pimlico in 1816, was admitted a student of the Academy in 1834, and received instruction from Wilkie. After studying at Rome (1836-38) he gained the silver medal of the Academy of St. Luke, and applied himself to the practice of fresco at Munich under Cornelius. His 'Dr. Johnson Reading the MS. of the Vicar of Wakefield' brought him into notice in 1843. Among his many subsequent works were 'Goldsmith as a Wandering Musician,' 'Dr. Johnson in the Anteroom of Lord Chesterfield,' 'The South-Sea Bubble,' 'James II. receiving Tidings of the Landing of the Prince of Orange,' 'The Royal Family of France in the Temple,' 'Execution of Montrose,' 'Antechamber at Whitehall during the Dying Moments of Charles II.,' 'Johnson and Wilkes,' 'Baxter and Jeffreys,' 'Eve of St. Bartholomew,' and 'William III. at Windsor.' In 1846 W. was made A.R.A., and R.A. in 1855. He was commissioned in 1853 to paint eight pictures for the corridor of the House of Commons, and these include his 'Charles II. assisted in Escape by Jane Lane,' 'The Acquittal of the Seven Bishops,' and 'Last Sleep of Argyle.' He died at Windsor, 15th January 1879.

War'den, Lord. Before the union between England and Scotland the duty of protecting the border counties of the former country from hostile raids was assigned to certain officers called

Lord Wardens of the Marches. The L. W. of the Cinque Ports is a dignitary dating from the days of William the Conqueror. He has a peculiar maritime jurisdiction and the nominal guardianship of the south-eastern coast of England, but the office is almost a sinecure. It gives right to the use of Walmer Castle as a residence. There is a L. W. of the Stannaries (q. v.).

Ward'holding, the military tenure of land in Scotland under the feudal system, under which the vassal was obliged to serve the superior in war, when called on to do so. The tenure, being considered unsuited to the times, was abolished in the reign of George II.; tenures from the Crown being changed into *Blanch*, those of subjects into *Feu*. See FEU.

Ward'ian Cases are boxes covered with tight-fitting frames of glass, under which plants are successfully raised that could not be grown in the vitiated atmosphere of some cities or dwellings. They are named after Mr. N. B. Ward, a surgeon of London, who first announced his discovery to Sir William Hooker in 1836. Plants have been successfully transported long distances packed in W. C. By means of them Mr. Fortune conveyed 20,000 tea plants from Shanghai to the Himalaya, and they have enabled the transport to be effected of the cinchona tree from S. America to India. Mr. W. never received any recognition of his services from the state.

Ward'law, Ralph, D.D., the most eminent name in the history of Scotch Congregationalism, was born at Dalkeith 22d December 1779. He studied at the University of Glasgow, and at the Selkirk 'Hall' of the Burgher Synod; but, becoming dissatisfied with the tenets of that body and of Presbyterianism in general, he embraced the doctrines of the Independents. He held office in that body, first at Perth, then at Dumfries, and finally (1803) at Glasgow. He also (1811) became principal professor of theology at the 'Hall' of his denomination in that town. In 1818, W. received the degree of doctor in theology from Yale College. He died 17th December 1853. His jubilee had been celebrated the previous February. W. wrote a large number of works, chiefly of a polemical character; the chief were—*Discourses on the Socinian Controversy* (1814), *Unitarianism Incapable of Vindication* (1816), *Dissertation on the Scriptural Authority, Nature and Uses of Infant Baptism* (1825), *Discourses on the Sabbath* (1832), *Christian Ethics* (2d ed. 1834), and *National Church Establishments Examined* (1839). Besides these, W. published a number of sermons, a discourse on miracles, and a number of writings in support of the peculiar doctrines of his own sect. W. was a man of very orthodox opinions. These he defended with zeal and ability, and at the same time fairly and moderately. His style is chaste, clear, and vigorous. A certain narrowness observable in his works is to be attributed, not to the man, but rather to the circumstances in which he was placed. See *Life and Writings of W.*, by Dr. W. L. Alexander (2d ed. Lond. 1856); also W.'s lectures on *Systematic Theology* (3d ed. Edin. 1858), and his *Posthumous Works*, edited by his son (8 vols. Edin. 1861-62).

Ward'law, Elizabeth Halket, Lady, a Scottish poetess, daughter of Sir Charles Halket of Pitferrane, was born April 1677, married Sir Henry Wardlaw of Pitreavie in 1696, and died in 1727. She is the authoress of the fine ballad of *Hardyknute*, which was long handed about in MS. as a genuine product of antiquity, and was printed as such by Ramsay in his *Evergreen* (1724). The secret of the authorship was first disclosed by Percy in his *Reliques of Ancient English Poetry* (1755). Lady W. also touched up the ballad of *Gilderoy*; Kirkpatrick Sharpe was 'almost persuaded' that she wrote 'the grand old ballad of *Sir Patrick Spens*,' and finally Dr. Robert Chambers, in a controversial pamphlet, ascribed to her the fabrication of most of the 'historical' Scottish ballads.

Ware, a market-town of Hertfordshire, England, on the Lea, 22½ miles N. of London by rail, has two churches, the cruciform St. Mary's (restored at a cost of £5800) and Christ Church (1858) in Early English style. There are besides four Dissenting chapels; St. Edmund's College (1795), which has a fine church by the elder Pugin, and was the meeting-place of the fourth provincial synod of the Catholic hierarchy (1873); a town-hall, corn exchange (1867), and the remains of a noble priory (1233); whilst among the chief lions of W. is its famous Bed (q. v.), alluded to in Shakespeare's *Twelfth Night* (iii. 2). Malting, brewing, and brickmaking are the chief industries. Pop. (1871) 5403. The name W. is a form of weir or 'dam,' one having been made here by the Danes.

Ware'ham ('the fortified place'), an ancient town of England, in Dorsetshire, situated at the head of a land-locked haven, a branch of the greater one of Poole, on the isthmus of a peninsula formed by the confluence of the southern Frome and Piddle, 32 miles S.S.W. of Salisbury by rail. It is girt on three sides by rectangular ramparts of earth (30 feet high), the origin of which is uncertain. The Norman church of Lady St. Mary contains some fine 13th-c. tombs. The town has shrunk within its wall, but it still has some industry in brewing, malting, and the making of bricks and potter's clay. Pop. (1871) 6532. W. first appears in history in 876, when the Danes marched thither from Cambridge, and, after swearing oaths and giving hostages, marched thence to Exeter in the following year. In the reign of Edward I. W. was a special quarter for the king's housecarls, but of its castle only meagre traces are visible. From Edward's time it sent two members to Parliament; but since the first Reform Bill it returns only one.

Ware'hou'sing System. See EXCISE, and under BOND, BONDED WAREHOUSE. Goods bonded in the warehouse must be so stowed as to leave easy access to each package. The occupier of the warehouse is liable to pay duty if he allows a package to be taken away without entry. Goods must be removed within three years; ship's stores within one. If not, they will be sold to defray rent and charges.

War'ham, William, born about 1450 at Church Oakley, Hampshire, from Winchester was elected scholar of New College, Oxford, of which he became a fellow in 1475. At Oxford he commenced the study of law, and having taken his LL.D., repaired to London (1488) to practise in the Court of Arches. His sober abilities were brought by Archbishop Morton under the notice of Henry VII., who attached him to Poynings' embassy to the court of Burgundy (1493, the probable year of W.'s ordination). His luculent exposure on this occasion of Duke Perkin's claims led to his rapid advancement, and he became precentor of Wells, Master of the Rolls (1494), Archdeacon of Huntingdon (1496), Bishop of London and Lord Chancellor (1502), and Archbishop of Canterbury (1503). The popular minister of an unpopular king, W. was charged with divers important missions, but as an opponent of the marriage to Catherine enjoyed less favour with the Eighth than the Seventh Henry, and in 1515 gladly resigned the Great Seal to Wolsey, having laboured to get quit of it for several years. With Wolsey he always stood on amicable terms, but his chosen friends were the scholars of the New Learning, Colet, Grocyn, Linacre, and Erasmus, all of whom he helped to preferment, which Erasmus repaid by the noble preface to his *St. Jerome*. From lettered retirement W. was called in 1529, weighed down with age and bodily infirmities, by the burning questions of the royal divorce and royal supremacy. On the first he sided passively with Henry, on the second yielded, presenting the submission of Convocation to the King three months before his death at Canterbury, 22d August 1532. He died, indeed, none too soon, since he left a protest that he could never have suffered any derogation of the Holy See, being no 'Reformer,' though favourable towards reform, the suppresser of Tyndal's version, though agreeing with Erasmus that reformation must come from a critical study of the Scriptures, and though wholly guiltless of the persecutions malignantly ascribed to him by Foxe. Learning owed much to his conduct as Chancellor of Oxford; and Erasmus has painted his kindly, witty, simple, open-handed, holy character. See vol. vi. of Hook's *Lives of the Archbishops of Canterbury* (Lond. 1868).

Wark'worth, a seaport of Northumberland, England, on the Coquet, 15¼ miles N.N.E. of Morpeth by rail, has an ancient parish church with a spire 100 feet high, but is chiefly celebrated for its noble castle, a stronghold of the Percies, which, crowning a bold eminence on the right bank of the river, was built in the reign of Edward III., and still uprears its lofty keep and Lion's Tower. The Hermitage of Bishop Percy's poem, with its exquisite little chapel, lies ½ mile distant. The trade of W. is chiefly carried on from Amble, 1 mile to the S.E., on whose harbour £250,000 had been expended up to 1876, and which in

that year had 32 ships. A church, in Early Decorated style (1870), schools (1872), and a pier, quays, tramways, &c., all recently constructed, mark the growing importance of the place, which is due to its vicinity to the great Radcliffe coal-seam. Brickmaking, herring-fishing, and salt manufacture are also carried on. Pop. of W. (1871) 5087; of Amble, 1275.

Warm'-blooded An'imals, the name given to *Mammalia* and *Aves* or Birds, in contradistinction to Fishes, Amphibians, and Reptilia, as lower vertebrata, and to all *Invertebrate* animals. In the latter, the blood is only a degree or two warmer than the medium in which they live, whilst in mammals and birds the blood greatly exceeds the outer temperature in heat. The average mammalian temperature varies from 99° F. to 100° F., as in man and his nearest allies, to 103° F. in the whales. In birds, which are the warmest-blooded animals, the lowest temperature is about 154° F., and may range to 110° or 112° F. This would represent an excessive fever heat in man. In hybernating animals the temperature falls considerably, as the tissue-waste is reduced to its minimum. The production of heat depends on the union of oxygen in the blood with carbon and hydrogen in the tissues; active habits, as in birds, demanding a large supply of oxygen, and producing heat accordingly.

Warm'ing and Ventila'tion. These two questions are so intimately related to each other that the one cannot be discussed without the other; indeed they are only two sides of one subject —the controlling of the air within apartments and inclosed spaces of all kinds. While warming has to do with the temperature of the air only, ventilation is concerned with its purity and fitness for breathing. The question of warming, it will be found, has an important bearing on ventilation; and without the latter, safe and healthy artificial heating would be impossible. W. and V. may thus be said to embrace the science of keeping the air of apartments in that condition most conducive to health and comfort. The necessities of the case as to artificial warming vary, of course, with the climate and mean temperatures of different localities, and these variations also modify the conditions of ventilation. Appliances and conditions, therefore, that are needful and indispensable in Arctic regions are not essential in temperate, and would be very much out of place in tropical latitudes. It is only in cases where the external temperature falls so low as to produce, by the rapid radiation of heat from the body, a feeling of cold, that artificial heating is needful to comfort. In this connection it is necessary to correct a popular misconception to the effect that the animal body receives any actual accession of heat from the warmth of a room, or from other external sources. The body temperature is, as a rule, much higher than that of the air with which it is surrounded, and the object of artificial warming is only to prevent that rapid radiation of heat from the body surface which results in the unpleasant sensation of cold. The most comfortable average temperature is from 60° to 65° F., and the object of artificial warming is to produce and to disseminate through an apartment that amount of heat. For hospitals and sick-rooms a higher temperature is generally requisite than for ordinary apartments. The methods by which artificial warming is effected embrace (1) the open fireplace or grate system, (2) stoves, and (3) heating apparatus. Of these, the most ancient, wasteful, and yet prevalent system, so far at least as concerns dwellings, is the method of heating by the open grate; but apart from its wastefulness, the radiant heat of an open fire is generally allowed to be the most healthy and pleasant, as it affects the body against which it strikes without overheating or contaminating the air through which it penetrates. It is, however, impossible to warm a large hall by radiant heat without enormous waste, as the heating effect decreases in proportion to the square of the distance of any point from the source of the heat. It is only in comparatively recent times that the true principles of constructing and using open fireplaces have been understood, and great discomfort with very little heat was obtained from the huge yawning chimneys, in which great fires blazed in the halls of our forefathers. Of the heat derived from an open fire, one, and by far the larger part, passes up the chimney, and this, although yielding little or no useful heating effect, is essential for the production of a draught to carry away the gaseous products of combustion, and thereby secures the ventilation of the apartment. Of the heat which goes to produce warmth the greater part is due to direct radiation from the fire, but a certain portion is also reflected from the grate and the materials which surround the fire. For efficient radiation it is necessary to carry the fire as near the front of the grate as is possible consistently with the escape of the gases by the chimney, and a grate ought therefore to be wide and deep rather than broad from back to front, as thereby the largest surface of glowing heat is brought forward. The surface in immediate contact with the fire ought to be of firebrick and not of metal, as the bricks retain and transmit a great part of the heat communicated to them, whereas iron, which is an excellent conductor, carries the heat away and passes it up the chimney, or into the mason-work with which it is connected. The outline of a proper grate is such as to secure a proper reflecting surface for the radiant heat which falls on it, and the chimney throat ought to be sufficient to pass the smoke and gases of combustion and no more. These are the principal points attended to in all the numerous forms of ordinary open grates which are now in the market. As, however, a much larger proportion of the heat passes up the chimney than is absolutely required for producing a draught and ventilating the apartment, numerous devices are applied for the utilisation of a portion of the heat which is thus wasted by an ordinary grate. Grates constructed on the principle of utilising the heating effect of the gases in the chimney are known as ventilating grates. A simple form of ventilating grate designed by Douglas Galton illustrates the structure of this form of grate. In it the hot gases pass up a cylindrical iron flue placed within the chimney, and around that flue a current of air admitted from the outside circulates, and being thus heated it is passed into the room by an aperture near the roof. Thus heated pure air is admitted above, while the colder and vitiated air is carried away by the combustion within the open fireplace.

Stoves.—A stove differs only from a grate in not being sunk in the wall of the apartment, and in being so constructed that the fire-bars can be closed over, and thus the combustion regulated at will. The amount of heating effect derivable from a well-constructed stove is much greater than can be obtained from an open fire; and therefore in countries where fuel is dear and the winters are severe, stoves are much more commonly used than grates. The stove is, however, a much less healthy source of warmth than grates. Stoves composed principally of cast-iron heat quickly, and they not only over-dry the atmosphere of the room, but when heated to redness they become permeable to the gases of combustion, and transmit into the air a noticeable proportion of the deadly gas carbonic oxide. Stoves with brick, fire-clay, or earthenware sides, are free from the latter defect, but they heat only slowly, while the ventilation of a room is defective with all kinds. The form of stove used in Russia (fig. 1) is divided into a series of compartments or chambers placed over each other, in the lowest of which the fuel is consumed, and the smoke and hot gases circulate through and heat the whole, which thus present a large radiating surface to the apartment. Dr. Arnott's stove, invented in 1855, was designed to secure improved ventilation, and to utilise the heat without dangerous overheating. It consists of a double-casing (section, fig. 2), air circulating and becoming heated in the outer space, and in the inner firebrick-lined portion the fuel is burned, air being admitted at the bottom, and the product of combustion passing off by a pipe as indicated by the arrows. The Gill stove is a further improvement now generally applied to heating stoves. It was devised by an engineer, Sylvester, and consists of a series of vertical plates thrown out from the outer stove casing, whereby a great radiating surface is secured in a compact and convenient manner. In some

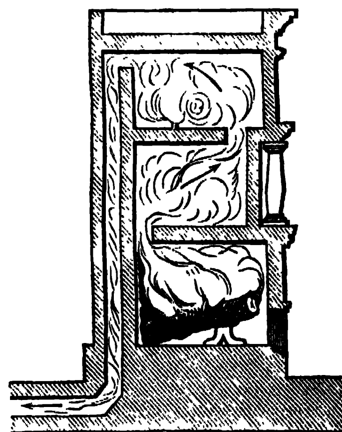


Fig. 1.—Section of a Russian Stove.

stoves there is an arrangement for heating and evaporating water, thus preventing the over-drying of the air, and keeping the stove itself from becoming heated to redness. The modifications of stoves on these principal lines are endless.

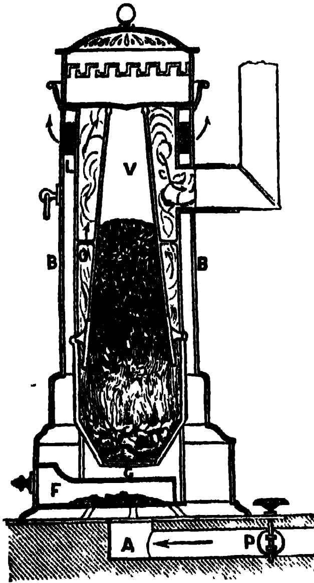


Fig. 2.—Section of Heating and Ventilating Stove. A, Inlet Air Pipe; B, Outer Casing; P, Valve; F, Ash Box; V, Fuel Space; G, Fire-bars; L, Hot Air exit.

Heating Apparatus is the most economical and cleanly, and for large apartments, schools, and halls the only efficient system of warming. Certain kinds have the additional advantage of being the freest from all risk of fire, as the heat is generated in a space generally set apart for that purpose alone. Under the term heating apparatus are included all forms in which the heat is generated in one place and conveyed by some means to warm one or more separate apartments. Thus certain hot-air stoves and ventilating fireplaces are forms of heating apparatus, but in addition both steam and hot water are used as warming mediums.

In factories and establishments where high-pressured steam is employed, the exhaust steam from the engines is in many cases passed through a series of tubes and used for heating. It is also economical and convenient to convey steam under pressure direct from the boilers through tubes, and, of course, in the latter case the amount of heat given off is very much greater. In such a case, pipes of small dimensions suffice for heating, and the size and amount of piping must be arranged with regard to the space to be heated, and the average pressure or heat at which it may be convenient to use the steam. Where the steam has to be specially raised it is generally preferable to use hot water in pipes.

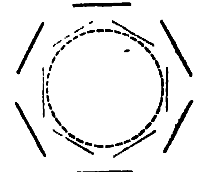
Heating by water is carried out on two different systems; 1st, the ordinary or low-pressure system; and 2d, by Perkins' high-pressure system. In the low-pressure system the heat of the water never exceeds boiling point, and the principle is that by which hot water is conveyed to the various floors of an ordinary dwelling. The coils of pipe for heating ought to be arranged so that the incoming air passes over and is heated by them. The sole objection to the low-pressure system is the size and extent of the coils of piping necessary for adequately heating apartments of any considerable size. This objection is obviated in the high-pressure apparatus of Perkins, which consists of coils of pipe hermetically sealed, in which the water, superheated from 300 to 350° F., circulates with great rapidity. The pipes in this system are not more than an inch in circumference, made of malleable iron, and of great strength. There is greater danger of fire with high-pressure pipes, and leakage at any joint may occasion serious scalds or burns.

For manufacturing purposes very highly heated apartments are sometimes required, and among the devices employed to raise and maintain a high heat may be mentioned the use of Root's blower, or some similar device, which, passing a large body of air over an enormous coil of steam-heated pipes, raises and maintains a high temperature. A proportion of moisture may be added to this heat by injecting steam with the heated air.

Ventilation consists in the removal of impure air from an apartment, and in replacing that withdrawn with pure respirable air. As the structure of modern dwellings has improved and domestic conveniences and comforts increased, in proportion has grown the necessity for devising a sufficient means of securing ventilation, and though the problems connected with the subject appear to be simple, no method of ventilation has yet been devised which meets the necessities in every case, while the confidently touted nostrums of quacks are unusually numerous. The means by which the air of any apartment is vitiated are respiration, the products of combustion in artificial lighting, and the effluvia from the uncleanness of the apartment or the bodies within it. According to the purpose to which any apartment is devoted the means of ventilation must be proportionately modified. Thus in hospitals very special attention must be given to ventilation, and for theatres and other places where large bodies of people are closely packed together under artificial illumination the most complete system of ventilation is essential. The air in such places requires to be changed much more frequently than in any ordinary overcrowded apartment, and as the necessary rapidity of change increases, so also increase the difficulties of safe and comfortable ventilation.

The motion of any body of air is determined by a difference of pressure between it and that of the air surrounding it. Such a difference of pressure may result from heating the air, whereby it is expanded and tends to rise; or it may be due to the winds and external currents of air; or it may be artificially produced by suction or propulsion. Each of these causes is taken advantage of in the ventilation of rooms and halls. In all applications of ventilating agencies the points to consider are the means of admitting fresh air and of allowing the vitiated air to escape. Air must not only be introduced in sufficient quantities to maintain a healthy atmosphere, but it must also be introduced in a gentle, even, and imperceptible manner, draughts or felt currents of cold air being as dangerous as impure air.

In ordinary dwelling-houses heated by grates, the open fire usually exerts sufficient suction to renew the air as frequently as necessary, and the opening of doors and chinks of windows affords ample and properly-extended openings for the renewal of the air withdrawn by the fire. Where open fires are not used, the burning of gas jets under the orifice of ventilating shafts or tubes is a means of producing an outward current of air. The sun-lights in public buildings and the central chandeliers in theatres are thus utilised. The same principle is also applied in the ventilation of coal-mines, where an upward current is secured by the burning of large fires at the bottom of the upcast shaft. The ventilating power of external wind-currents is of course strong in proportion to the strength of the wind. Among the various forms of external ventilator designed to extract air by means of the wind may be mentioned the simple tube with a wide opening or cowl, which turns away from the wind; the archimedean ventilator which turns with the wind, and thereby rotates an exhausting screw within itself; simple louvres having a revolving fan within them; and the air-pump ventilator, the segments of which are arranged so as to direct the wind past the ventilating slit (fig. 3), and thus exert an extracting power while blowing from any direction. A study of almost any roof or set of chimney-pots will show how numerous and varied are the devices for keeping up a current of air in a uniform direction, and the prevalence of smoky chimneys is a practical commentary on their efficiency.


Fig. 3.—Ground Plan of Air Pump Ventilator.

The ventilation of the English Houses of Parliament may be taken as an example of a system successfully carried out on the best principles, for halls in which the necessities of ventilation vary enormously from time to time. The air is admitted into the lower part of the building by louvres, and there is an arrangement by which it can be laden with moisture, cold or hot, according to the season. It passes on to a series of immense steam-boilers, the number of which, and consequently the extent of heating surface, varies with the required temperature. These are placed under the central hall, and the heated air passing on from them is sifted through gauze to intercept particles, and thereafter admitted into the two houses, &c., through gratings in the floor covered by matting. The quantity of air to be admitted is regulated with the utmost ease by brattice-cloths placed over the mouth of the channel which leads the air from the heating boilers. The vitiated air is extracted by the suction of a large fire at the base of a central flue with which the two chambers are connected, and the gas at night being placed in the ceiling also aids in the extraction of the heated and vitiated gases.

The propulsion or suction of air into any space by mechanical agency—*e.g.*, by the use of rotating fans, or any form of blowing engine—has the great advantage of being in all circumstances under the most perfect control. It is, however, expensive in operation, and except in circumstances of special necessity is not put in operation. The punkah, used in India for creating a current of air within rooms, may be regarded as a form of mechanical ventilator, and indeed in a restricted sense the ordinary hand-fan of the ladies is similar in its purpose.

The artificial production and maintenance of a cold atmosphere has now become a most important problem in connection with the transport and preservation of meat in a fresh condition. See PRESERVED FOOD.

War'minster ('the monastery near the weir'), an old town of England, in Wiltshire, on the W. border of Salisbury Plain, and 19 miles W. of Salisbury by the Great Western Railway. The church, dedicated to St. Denis, has a tomb of Edward III.'s time; the St. Lawrence proprietary chapel was founded under Edward I. and rebuilt in 1725. There are several interesting antiquities, including the 'King's Barrow.' The making of broadcloth, for which W. was once famous, has long since ceased, but there is considerable local trade. Pop. (1871) 5786. Four miles S. is Longleat House, the seat of the Marquis of Bath.

War'-Office, one of the chief departments of Government presided over by the Secretary of State for War, who is assisted by a Permanent and a Parliamentary Under-Secretary of State. The W. O. is subdivided into three departments—military, ordnance, and financial, under the respective control of the commander-in-chief, the surveyor-general of the ordnance, and the financial secretary. The first officer has the supervision of the *personnel* of the army and all matters affecting its efficiency; the second deals with supply of all kinds, transports, &c.; the third with pay, audit, and kindred affairs.

W. O. Regulations embrace warrants and orders issued by the Secretary of State for War for the guidance and instruction of the various branches of the service. They are communicated to regiments and departments by circulars issued through the Horse Guards.

Warp is the longitudinal threads or yarn in any woven fabric. See WEAVING.

Warp'ing, in agriculture, is a process for adding to and enriching the soil by means of detritus carried down by rivers, or borne inland by the flowing tide. The operation, which consists in inclosing a body or sheet of water till the sediment it holds in suspension has deposited, can only be carried out on flat low-lying tracts which may be readily submerged. It is analogous to the natural process of fertilisation effected in Egypt by the Nilotic floods, and although little practised in the United Kingdom, it is of importance near the mouths of many European rivers.

Warr'andice, in Scotch law, is an obligation by which the party conveying a subject or right is bound to indemnify the grantee, disponee, or receiver of the right, in case of eviction, or in case of real burdens having been created over the subject before the date of conveyance. W. is *personal*, or *real*. The former binds the grantee and his heirs personally. By the latter, real estate is conveyed in security of the guarantee.

Warr'ant of Arrest' is usually issued on application to a justice of the peace. It should set forth the time, place, and cause of making. It should be directed to the peace-officer, requiring him to bring the accused person before a justice of the county, or before the justice who grants the warrant. The warrant in the latter case is called a *special* warrant. A warrant from the Queen's Bench division has force over all England, but the warrant of a justice of one county cannot be executed in another till signed by a justice of that other county. Some legal officers, justices, sheriffs, &c., may arrest without a warrant.

Warr'ant of Attor'ney. See ATTORNEY, WARRANT OF.

Warr'anty of Goods. In English law, if an *express* warranty proves false, the buyer is entitled to return the goods or to receive compensation, but a *general* warranty does not guarantee against obvious defects. See FAULT (in law).

Warr'en, Henry, an English artist, was born in London 24th September 1798, studied sculpture under Nollekens along with Bonomi and Gibson. After practising modelling at the British Museum, he became a student at the Academy in 1818, devoting himself ardently to painting in water-colours. Among his chief works are 'The Happy Valley,' 'Rebecca at the Well,' 'Christ and the Woman of Samaria,' 'The Death of the First-born,' 'The Dying Camel in the Desert,' 'The Crusader's First Sight of Jerusalem,' and 'First Sunset seen by our First Parents.' In 1835 he became a member of the Society of Painters in Water-Colours, of which, in the reorganised form as the Institute, he was president for thirty years. He has written *Artistic Anatomy* and *Water-Colour Painting*, both popular works.

Warr'en, Samuel, English novelist and lawyer, was born in Denbighshire, 23d May 1807, studied at Edinburgh for the medical profession, but afterwards went to London and qualified as a lawyer. He was called to the bar at the Inner Temple in 1837, made Queen's Counsel in 1851, and appointed Recorder of Hull in 1852. The following year brought him the degree of D.C.L. from Oxford; in 1856 and 1857 he was elected a member of Parliament; and in 1859 he was appointed by Lord Chelmsford a Master in Lunacy. He resigned the recordership of Hull in 1874, and died 29th July 1877. W.'s best achievements in fiction were *Diary of a Late Physician* (Lond. and Edin. 1832, 2 vols.), and *Ten Thousand a Year* (Lond. and Edin. 1841, 3 vols.); and in professional literature, *Popular and Practical Introduction to Law Studies* (Lond. 1835; new ed., entirely remodelled, &c., Lond. 1845); and *Blackstone Systematically Abridged* (Lond. 1857). As a novelist W. enjoyed an amazing success, which was not confined to England, but extended to America and the Continent. He possessed genuine humour, but of the kind which is hardly to be distinguished from extravagance and caricature. 'Tittlebat Titmouse' in *Ten Thousand a Year* bids fair to live long in the popular memory as the embodiment of a 'cad' blossoming into a 'swell.' Of W.'s lesser productions it is enough to note *The Lily and the Bee* (Lond. 1851), a strange rhapsodical poem on the Great Exhibition of 1851; *Now and Then* (Lond. 1847), a novel of religious tendency; and *Moral and Intellectual Development of the Age* (Lond. 1854). A collected edition of his literary works was published in 5 volumes (Lond. 1853-54), having been preceded by a German edition by Tauchnitz (1843-48).

Warr'ington, an old town of Lancashire, on the right bank of the Mersey, 20 miles E. of Liverpool by rail. It has a noble church, with a high steeple, which was restored at a cost of £14,000 in 1863, and five new churches have been lately built; the last, St. Barnabas, in 1879. There are many quaint timber-houses, and among the modern buildings are the town-hall (1862), the post-office (1876), and an hospital, erected (1876) at a cost of £7000. A good library of 2000 volumes was gifted to the town in 1875. Wire-drawing is a leading industry, and the manufactures comprise wire-work, files, edge-tools, pins, heavy leather goods, fustians, corduroys, twills, soap, glass, &c. W. is celebrated for its ale. The river is here crossed by a bridge, and the town is approachable by vessels of 100 tons. In 1877 the customs revenues amounted to £11,252. W. sends one member to Parliament, and publishes three newspapers. Pop. (1871) 33,053.

Warrnambool', a seaport of Victoria, Australia, 170 miles S.W. of Melbourne. It has a safe harbour, and being the centre of a rich agricultural and pastoral district, exports largely potatoes, wheat, wool, and preserved meat. Pop. (1876) 4600.

War'saw (Pol. *Warszawa*, 'the fortified place,' Ger. *Warschau*, Fr. *Varsovie*), the capital formerly of Poland, now of the government of W. in Russia, lies in the form of a half-moon along the left bank of the Vistula, 676 miles S.W. of St. Petersburg by rail. It consists of an old and a new town and several suburbs, the principal, Praga, on the opposite side of the river, joined to the city by two iron bridges, the one for public traffic 1663 feet in length, the other—a railway bridge —built in 1873. W. is strongly fortified, girt with walls and ditches, and commanded by the impregnable Alexander citadel, built 1832-35. Within its walls are an extensive parade-ground, 12 handsome squares, several avenues planted with poplars and chestnuts—the principal, the Jerosimer and Ujasdower—and more than 200 streets, of which the finest are the Lesch-no, Miodowa, Dluga, Nowy Swiat, Electoralna, Mazowiecka, and Czysta streets, and the Krakowski Przed-

miast, with an equestrian statue of Jozef Poniatowski, one of the masterpieces of Thorwaldsen. Opposite Praga, from terraced gardens along the bank of the river, rises the grandest edifice in W., the former royal castle, a two-storied square, built by Sigismund III. and completed by Stanislaus Poniatowski, containing the Polish archives and a rich collection of pictures and statues. Other buildings are the Saxon palace, the residence of Augustus II. and Augustus III., with a fine garden; the government buildings, formerly the Radziwill Palace; the war-minister's palace, formerly that of the primate; the town-house, formerly the palace of Prince Jablonowski, newly built after the fire of 1863; the university, formerly the residence of Jan Kazimierz; and the more than 100 other palaces of the old Polish nobility. Among the 85 churches of W. the finest are the Catholic cathedral of St. John, founded in 1360, connected with the castle by a corridor, and containing Turkish spoils of John III. Sobieski, and a fine altarpiece by Palma Nova; the Greek cathedral, completed in 1842; the Lutheran church, in the centre of the city, one of its loftiest buildings; the Reformed church, built in 1623 by Sigismund III.; the churches of the Holy Cross, Borromeo, and St. Alexander; and a new synagogue, opened September 1878. The educational institutions are the university, founded in 1816, abolished in 1832, but restored in 1864, with a library of 200,000 vols. and a fine botanical garden (450 students); 6 Gymnasia, with 2364 students; a Realschule, with 388 pupils; the Institute of St. Mary, a ladies' school, with 247 pupils; 4 Gymnasium for females, with 1126 pupils; a normal seminary, with 59 students; 147 private schools, with 11,037 pupils; a veterinary school, with 92 students; a school of design, with 258 students; an institute for the deaf and dumb and for the blind, with 222 pupils; a commercial school, with 300 pupils; a Sunday commercial school, with 581 pupils; and several schools for artisans, with an aggregate attendance of 4604. The chief benevolent society has an annual income of £12,650. In 1877 the hospitals had 37,330 patients, and the foundling hospital in 1873 4000 children. W. is the centre of the industrial and commercial activity of Poland. It has nearly 300 factories, and produces annually goods to the value of nearly £3,000,000; consisting chiefly of tobacco, distilled products, beer, milled products, oil, waggons, &c., musical instruments, machinery, gold- and silver-plated articles, and other metal wares, chemicals, soap, and leather. Pop. (1877) 315,199 (185,811 Catholic, 104,160 Jews, 16,926 Protestants, 8796 Greek Catholics), besides a strong garrison (before the Turkish war 21,933 men). The history of W. is noticed under POLAND.

Wart'burg, War of the, was a poetic contest between the most famous minstrels of the day, said to have taken place at the castle of Wartburg, near the town of Eisenach, in 1206 or 1207. The strife is described in a celebrated poem by an unknown author, of date about 1290, and written in Middle High German. The poem consists of two parts. In the first we are told how Heinrich von Ofterdingen sings the praises of Duke Leopold of Austria, whilst Walther von der Vogelweide extols the deeds of the Landgraf of Thüringia. In this strife Walther is victorious. The second part (of much later origin) tells how the magician Klingsor, from Hungary, comes at the call of the discomfited minstrel. A sharp trial of wit ensues between the new-comer and Wolfram von Eschenbach, in which the latter triumphs. The fact that some sort of a poetic contest did probably take place at Castle Wartburg about the time indicated does not at all prove the authenticity of the alleged account, of which the incidents are pure fiction. The best edition, with translation into modern German, is by Simrock (Stutt. 1858). See also Lucas, *Ueber den Krieg von Wartburg* (Königsb. 1838); Plötz, *Ueber den Sängerkrieg auf der Wartburg* (Weim. 1851). The story is also poetically treated in Wagner's 'Tannhäuser.'

War'the, the principal tributary of the Oder, rises near Kromolov, in Poland, flows N., at Kolo turns to the W., at Schrimm again to the N., at Obornik to the W., and at the influx of the Obra finally to the N., at the influx of the Netze enters on the Wartebruch, a swampy tract 46 miles long by 9 wide, and joins the Oder at Küstrin, where it is 640 feet broad. Its tributaries are, from the right the Netze and Küddow, from the left the Prosna and Obra. Its total length is 487 miles, of which 222 miles belong to Prussia.

Wart'-Hog (*Phacochærus Œgypticus*), a species of *Suidæ*, or swine, found in Africa, and known at the Cape of Good Hope as the 'Vlacke Vark' and 'Engalla.' It attains a length of 4 feet, and is notable for its large tusks. Its colour is a dull or blackish grey. The head and fore parts are disproportionately developed as compared with the hinder parts, and the appearance of the animal is highly grotesque. The W.-H. is by no means destitute of courage, and the tusks constitute weapons of attack of no mean kind. The name is derived from the presence on the cheeks of warty growths or excrescences. An allied species is the *P. Œliani* or Abyssinian wild boar. An allied genus, *Potamochærus* or *Cheiropotamus*, includes the Bosch Vark (*C. Africanus*) or Bush-hog of S. Africa and the *C.* or *P. pencillatus* of W. Africa.

War'ton, Thomas, an English author, was born in 1728 at Basingstoke, where his father was vicar. In 1743 he entered Trinity College, Oxford, and in 1751 obtained a fellowship. From 1757 to 1767 he was professor of poetry, an office which his father had held before him (1718-28). In 1771 he obtained the living of Keddington in Oxfordshire, and in 1785 he was appointed Camden professor of ancient history and poet-laureate, both of which appointments he held till his death, May 21, 1790. W. began his literary career while still an undergraduate by a poem, *The Pleasures of Memory;* but he owes his importance to his critical and historical labours. His great work, *The History of English Poetry from the Close of the Eleventh Century to the Commencement of the Eighteenth Century* (vol. i. 1774, vol. ii. 1778, vol. iii. 1781; new ed. by Hazlitt, 3 vols. 1870), in spite of the multiplex activity of subsequent investigators in the same department, remains one of the most valuable of literary surveys. Among W.'s minor undertakings was an edition of Theocritus (1770), and some other work in the same department; *Observations on the Faerie Queene of Spenser* (Lond. 1754; new ed. 1762), a *Life of Sir Thomas Pope* (Lond. 1772), and an edition of Milton's *Poems upon Several Occasions* (Lond. 1785). He was one of the first of Englishmen to take a genuine interest in the old churches and castles of his native land, and at one time he intended to write a history of Gothic architecture in England. His observations critical and historical are still preserved in MSS., and a brief description of their contents will be found in the *Cornhill Magazine*, 1865, vol. xi. W. was a kindly-tempered blithe-hearted man, and most of his friends must have felt what his great posthumous friend Christopher North expressed, that he was 'one of the finest fellows that ever breathed.' A fondness for sights of all kinds was a noticeable feature in his character. See Life of T. W. prefixed to Richard Mant's edition of his Poems (2 vols. Lond. 1802).—**Joseph W.,** brother of the preceding, was born in 1722 at Dunsford in Surrey. From Winchester he proceeded in 1740 to Oriel College, Oxford, where in 1744 he took his degree of B.A. About the same time he was ordained curate at Basingstoke, and in 1748 he received from the Duke of Bolton the rectory of Winslade, which enabled him to marry. We soon after find him abroad with the duke, and, if the old biographer does not belie him, on no very honourable mission: the duchess was evidently dying, the duke had a mistress, and W. was to be in readiness to make the mistress a wife on the earliest opportunity. In 1754 he obtained the rectory of Tunworth; in 1755 he was appointed second master of Winchester School, and in 1766 head-master. He became a prebendary of St. Paul's (1782) and of Winchester (1788), and in 1793 resigned his post at Winchester, retiring to his rectory at Wickham. He died Feb. 23, 1800. Joseph W. has left no great work like his brother's *History of English Poetry*, but he contributed ably to the critical literature of the day. His *Essay on the Genius and Writings of Pope* (1st vol. 1756, 2d 1782) did good service by calling in question the canon of the prevailing school, which made the 'correctness' of a poet's style the measure of his greatness. Spenser, he maintained, was worthier than Pope of the title of poet. His minor productions comprise a translation of Virgil's Eclogues and Georgics, with essays on pastoral, didactic, and epic poetry, and contributions to the *Gentleman's Magazine, Dodsley's Museum*, and *The Adventurer*. He edited Pope's works, and left an unfinished edition of Dryden, afterwards completed by his son, John W. See Rev. John Woll, *Biographical Memoirs of J. W.* (Lond. 1806).

Warts, or **Verru'cæ,** are collections of hypertrophied papillæ covered with epithelium, and sometimes hardened by friction

and exposure. The most common situation of ordinary W. is the hands of children, and occasionally other parts of the body, as the eyelids and face. The *branching wart*, or *verruca digitata*, forms sometimes on the scalp of women. Sub-ungual W. form below and at the side of the nails, and from their position cause much pain. *Verruca confluens* is formed of a crop of small W. generally on the back of the hand, the arm, the neck, or the thorax. In such cases the skin may resemble coarse plush, and great irritation may be caused. Venereal W. are due to the irritation of discharges retained in contact with the skin or mucous membrane, and are frequently associated with condylomata consisting of hypertrophied skin. They often spread over a large surface and attain a considerable size. *Verrucæ necrogenicæ* are W. due to the irritation of morbid fluids, and are occasionally found on the hands of morbid anatomists. The causes of the common W. are unknown. They appear and disappear in a capricious manner, and usually they are a mere disfigurement. W. may be removed by thoroughly saturating them with nitric acid, the acid nitrate of mercury, glacial acetic acid, perchloride of iron, or by repeated applications of nitrate of silver.

War'wick ('the fortified place'), the county town of Warwickshire, 107¾ miles N.W. of London by rail, is chiefly situated on the southern shore of the 'sleepy, willowy Avon.' On the opposite bank, crowning a solid rock, stands W. Castle, rearing its towers, Cæsar's (147 feet) and Guy's (128 feet), above the cedars of the surrounding park, and storing within its state apartments rich tapestries, pictures by Rembrandt, Van Dyck, and Rubens, collections of armour and other rarities, among them the famous 'W. vase.' The restoration of its hall, gutted by fire in 1871, was completed (1876) at a cost of some £18,000. St. Mary's Church, mainly rebuilt in 1704, retains its old Perpendicular choir and Beauchamp chapel (1370–91), with the tombs of four centuries of W.'s earls; over the E. Gate is an ancient chapel, until recently used as a free school; and Leicester's Hospital, founded for twelve brethren in 1571, is a quaint quadrangular building, with a Gothic chapel surmounting the W. Gate, a mighty kitchen, and vaulted hall, profusely adorned with its founder's cognisance, the Bear and Ragged Staff. The town itself, having suffered much from fire, is generally modern, among the recent buildings being a Roman Catholic church (1860), the county hall and courts, a domed market-house, the county gaol (1860), a theatre, and antiquarian museum; and new waterworks were constructed (1876) at a cost of nearly £25,000. Ironfounding, brewing, and brickmaking are carried on, but agricultural produce forms the staple of the trade of W., which publishes one weekly newspaper and returns two members to Parliament. Pop. (1871) 10,986. Traditionally connected with King Cymbeline, its reputed founder in 1 A.D., and with Guy of Warwick, the vanquisher of the giant Colbrand, W. figures in *Domesday* with 261 houses, having earlier been sacked by Danes, but restored by Ethelfleda, Ælfred's daughter, in 914. William of Newburgh, a follower of the Conqueror, replaced her fortress by the castle, which Stephen surrendered to Prince Henry (1153), which was Edward IV.'s prison (1469), and which has been visited by many of England's kings. See vol. i. of Hawthorne's *Our Old Home* (Lond. 1863).

War'wick, Richard Neville, Earl of, 'the King-maker,' born about 1420, was the eldest son of the Earl of Salisbury, and by his marriage with the heiress of the Beauchamps himself became Earl of Warwick (1449). In the Yorkist victory of St. Albans (1455), the opening action of the Wars of the Roses, he fought on the winning side, and three years later sharing in the reconciliation between the hostile parties, was appointed lord-deputy of Calais and admiral of the fleet. As such he gained a splendid success over the Spaniards, but a quarrel between his followers and the king's led to charges of disloyalty, which he justified by taking the field at Ludlow with his cousin the Duke of York (1459). On the failure of that attempt he again with the Earls of Salisbury and March withdrew to Calais, a town devoted to his cause, and thence in the following summer recrossed to Kent, and, mastering London and capturing Henry VI. (q. v.) at Northampton, brought about the compromise by which Henry was to reign for life but acknowledge York for his successor. Margaret of Anjou would not thus tamely surrender the rights of her son, and first routing and slaying York and Salisbury at Wakefield advanced to St. Albans, where a second battle ended in W.'s defeat. W., however, joined the young Earl of March (now Duke of York), and striking with him boldly on London, placed him upon the throne as Edward IV. (q. v.), then chasing the Lancastrians back to Yorkshire, almost annihilated them on the bloody field of Towton, 29th March 1461. Possessed of immense domains and princely wealth, with one brother rewarded for his crowning victory at Hexham by the earldom of Northumberland, another made Primate and Lord Chancellor, W. indeed seemed able now, in Shakespeare's words, 'to do and undo, as him pleased best.' Edward's marriage, however, to Elizabeth Woodville pleased him not, especially as he was then negotiating for the king's alliance to Bona of Savoy; neither did the marriage of Edward's sister to Charles of Burgundy, the Earl's great foe. In retaliation W. bestowed his daughter on the Duke of Clarence, and after seizing on Edward's person, executing the queen's father and brother, and seeming to accept a pardon, involved himself in the insurrection of Sir Robert Welles (1470) for making Clarence king. Its failure drove him once more to France, where, through the mediation of Louis XI., W. engaged to restore the crown to Henry VI., and Margaret to wed her son to W.'s daughter Anne. His landing in Devonshire came like a thunderclap to Edward IV., who from the North, where he was busy quelling a revolt, escaped to Burgundy, leaving W. master of the kingdom. The triumph was brief, for when Edward returned in six months' time, W. found himself treated as he had treated others, and after fruitless overtures for a fresh desertion, he with his brother was routed and slain at Barnet, 14th April 1471. Of this 'Last of the Barons,' Mr. Gairdner says that 'his policy throughout appears to have been selfish and treacherous, and his removal was an unquestionable blessing to his country.' See Gairdner's *Houses of York and Lancaster* (Lond. 1874).

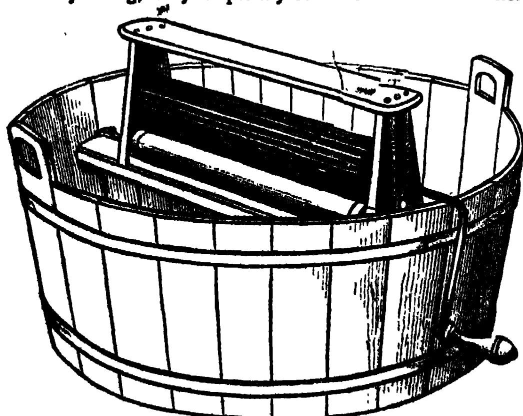
War'wickshire, a midland county of England, is bounded N.E. by Leicestershire, S.E. by Northamptonshire and Oxfordshire, W. by Gloucestershire and Worcestershire, and N.W. by Staffordshire. Area, 566,458 acres; pop. (1871) 634,189. The southern and larger portion of the county is traversed for 57 miles by the Avon (q. v.), and so belongs to the Severn basin; in the northern, formerly covered by the Forest of Arden, the Tame, an affluent of the Trent, rises and takes its course for 20 miles. Valleys alternate with gently-sloping uplands, and geologically W. mainly belongs to the Secondary formation, having one coal-field which yielded (1878) 930,850 tons, while the output of iron (1875) was 97,456 tons. The soil is chiefly red and sandy loams or clay, and in 1878 there were 142,316 acres under corn crops, 63,681 under green crops, 66,312 under clover, sainfoin, and grasses in rotation, and (1872) 18,529 of woods. In the same year W. had 19,928 horses, 90,272 cattle, 347,427 sheep, and 43,262 pigs. The manufactures, of high importance, have been described under their centres, Birmingham and Coventry, the other chief places being Warwick, Leamington, Rugby, Kenilworth, and Stratford-on-Avon. The county returns four members to Parliament, and its gross rental amounted (1874) to £3,428,771, its poor-rate (1877) to £296,121, and the number of its paupers (1878) to 18,352.

Wash, an estuary on the E. coast of England, having Lincolnshire in its N.W. and Norfolk on its S.E. side. Its length is 22 miles, and its breadth about 15. The Lynn Deeps on the Norfolk side, and the Boston Deeps on the Lincolnshire side, afford anchorage to well-sized ships, but most of the estuary is very shallow. The Witham, Welland, and Ouse are the principal rivers which enter the W. See Miller and Skertchly, *The Fenland* (Wisbeach 1878).

Wash'ing. In this article notice is taken of laundry operations only; the processes of W. connected with wool-scouring and the bleaching and printing of linen and calico being dealt with under separate heads. The W. operations of domestic life are of importance on account of the amount of labour and expenditure connected with them, and of their social and hygienic influence. In the practice of a well-conducted laundry or domestic W. there are considerable variations, the possession or want of various machines and appliances to some extent modifying practice. The absolute essentials of all efficient W. are a supply of pure soft water, soap, soda, a washing-tub, a boiler, and an expert pair of hands. With these only, and with a proper open-air drying and bleaching place, a large proportion of domestic W. is done, and that in a most thorough manner. In localities where

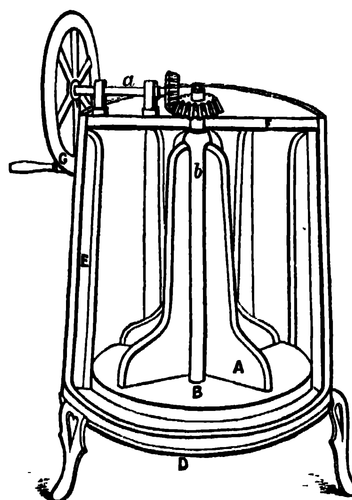
the ordinary water supply is hard, it is desirable to impound rain water, than which nothing can be better for W. Hard water is not only wasteful of soap and time, but in no case can it produce the satisfactory results that are derived from the use of a soft, easily-lathered water. In preparing for W. a separation is first made between white articles (*i.e.*, bed, table, and body linen) and coloured articles and woollens. The white articles are rubbed slightly with soap at the stained spots, and placed in steep for a few hours in water to which a proportion of soda, with sometimes a little soap, has been added. In the actual operation of W. the articles are wrung out of the steep; a tub is then half filled with water as hot as can be comfortably borne by the hand; to this a proportion of boiled soap, sufficient to raise a lather on the water when it is agitated, is added. The smaller, finer, and comparatively clean articles are first washed with the view of economising soap, and thereafter the larger articles are taken in hand, soap being rubbed on as needed where obstinate stain-spots remain. Coloured articles, such as printed calicoes, &c., require very careful treatment to preserve the brightness of the dye, and keep it from running over and clouding the lighter parts of the pattern. They cannot be steeped; no soda is to be added to the water; the articles should be washed out as quickly as possible, rinsed through cold water, and immediately hung up to dry. Similarly, woollen and worsted articles should be washed through a hot solution of soap with as little rubbing and squeezing as possible, shaken out, and quickly dried. In the case of white articles, after W. a common practice is to boil them in a solution of soap, thereafter rinse them through cold water, in which they may remain for some time, and where they may advantageously be treated with a minute proportion of laundry blue. From this the articles are squeezed as dry as possible and hung out to dry thoroughly. When dry the articles are neatly folded up, bed and table linen is mangled, other non-woollen articles are ironed; shirts, collars, and similar objects for personal wear are starched and smooth-ironed; and there are various other ways of finishing small articles. A commendable practice is to expose the articles immediately after boiling on a W.-green to the bleaching influence of the sun, after which they are washed up and dried. As a substitute for such bleaching, a proportion of a clear solution of bleaching-powder may, with good effect, be added to the cold steep after boiling. The W.-powders so much vaunted by their sellers are simply powdered soda with more or less of bleaching-powder (chloride of lime) added.

As already stated, a variety of mechanical appliances are now in common use for facilitating the laborious operations connected with W., but many W. machines are very destructive of clothes. The simplest aid is the W.-board, which consists of a fluted hard-wood board, or sheet of corrugated zinc laid slantingly into the tub, and on which the washer rubs with both hands. It would be impossible here to give any idea of the endless mechanical contrivances that have been introduced to supersede manual labour in W. They for the most part depend on either rubbing or beating in action, and as they possess little power of yielding, they frequently strain and tear the articles.



People's Washing Machine.

The 'Peoples' W. Machine,' made by Macfarlane, of Albert Works, Glasgow, is very simple, and the cheapest of all mechanical washers. It washes by friction and pressure, and, as will be seen from the illustration, consists of two pressing and two crimping rollers fitted into a suitable frame, having the pressure supplied by spiral springs. These rollers work together, and act upon the clothes in the same manner as the knuckles in hand-W. The clothes are passed backward and forward between the rollers, and as they are being continuously saturated, the dirt is quickly loosened and carried off. One of the least objectionable of all machines is the 'Home Washer,' made by Taylor & Wilson, of Accrington, shown in accompanying fig. It is in form of a tub, made of staves, secured by galvanised iron hoops, and fitted internally with a series of upright breaks, shown at E. Across the top there is a strong wood cross bar F, and reaching from it to the bottom centre of the tub runs a shaft *b*. This shaft has a circular disc B attached to its lower end, and is provided with 4 radial fins A, of ogee form, the lower ends of which rest upon the disc or table. The central shaft is rotated or revolved by means of a set of mitre or cog wheels C, fixed to a wrought-iron shaft *a*, and moved by a crank G. By turning this crank the central shaft and its floats are rotated, thereby creating a violent commotion of the water; a series of counter currents are formed, which, forced by the action of these floats and breaks, passes through the fabric to be washed in every possible direction. W. machines are made of any size according to the necessities of the case, the larger ones being moved by steam. The clothes' wringer is a most desirable and useful instrument for squeezing water out of clothes. In consists of a pair of india-rubber rollers, mounted on iron spindles in a strong frame, and pressed against each other by a strong elliptic or other spring. In large establishments a hydro-extractor is used for drying, the effect of which is due to the centrifugal force developed by the extraordinarily rapid rotation of a circular basin with perforated sides into which the clothes are placed. For thoroughness, rapidity, and absence of all strain, no appliance can approach this apparatus, which has extensive application in other departments of industry as well as in domestic W.



Section of "Home Washer."

Wash'ing of Feet was a ceremony very generally practised in the primitive Church. The reason for it was threefold, or there seem to have been three kinds of it. (1) It was done in the case of travellers and guests as an act of Christian hospitality in imitation of time-honoured examples (*cf.* Gen. xviii. 4, xix. 2). (2) It was a practice for the Catechumens (q. v.), who had fasted and refrained from all ablutions during the whole time of Lent (q. v.), to bathe themselves, for decency's sake, previous to their baptism at Easter; and in some places this was changed into a ceremony of washing their feet by the bishop, as if it were an essential part of the rite of baptism, although, on the other hand, it was sometimes done after baptism just to prevent this

supposition. (3) A third kind of W. of F. was practised on a certain number of poor persons (generally twelve, the number of the disciples) on Maundy Thursday (q. v.) as a voluntary act of piety in imitation of the example and obedience to the command of Christ (John xiii. 1–15). This ceremony was kept up till comparatively recent times by many high dignitaries, and is still by the Pope.

Wash'ington, George, first President of the United States, was born 22d February 1732 at his father's house on the Potomac river, Westmoreland county, Virginia. His great-grandfather, John W., was an English royalist who emigrated to America during Cromwell's supremacy in England. Further back than this his ancestry cannot be satisfactorily traced. Some suppose the family to have belonged originally to the county of Durham, while others trace it to Sulgrave, Northamptonshire. W.'s father, Augustine W., was a wealthy landed proprietor. He was twice married, and had four children by his first wife, while W. was the eldest of a family of six by the second wife, Mary Ball, daughter of Colonel Ball, a Virginian gentleman of good station. He received little school education beyond the ordinary rudiments, the only subject which he prosecuted more deeply being mathematics. Nor does it appear that he received much culture from his home life, his parents being by no means above the average of their station in attainments, though they seem to have possessed in a great measure the strength of character and unswerving probity which were afterwards so splendidly developed in their son. Apart from certain apocryphal anecdotes, abundant evidence exists of the careful moral training which he received in his childhood. In all the athletic sports, too, of the rather rough colonial life around him, he was thoroughly proficient. His spare, well-knit frame combined considerable muscular strength with great capacity for endurance of fatigue; and these physical qualifications, along with his turn for mathematical work, led him to adopt the profession of a land-surveyor, in all new countries an important and lucrative business. It is probable, however, that but for his mother's opposition he would have chosen a naval career, a midshipman's warrant having at one time actually been obtained for him. He was sixteen years of age when he began active work as a land-surveyor on the great estate of Lord Fairfax in the Shenandoah Valley, and the laborious and even dangerous experience which this occupation involved stood him in excellent stead in after years. The colonial militia being organised for service against France in 1751, W., though only nineteen, was appointed adjutant with the rank of major, but did not then take part in any active service. In the same year he accompanied his elder half-brother, Captain Lawrence W., in a voyage to the Barbadoes. This was the only occasion on which W. left the American continent. Lawrence W., who had served under Admiral Vernon in the expedition against Carthagena in 1740, had inherited from his father an estate, which he called, in honour of his old commander, 'Mount Vernon.' Dying in 1752, he left all his property to an infant daughter, who also died shortly afterwards. The estate of Mount Vernon then came into the hands of W. himself, and was ever afterwards his family residence. About this time alarm was excited in the colonies by a scheme of the French government for connecting their possessions in Canada and Louisiana by a chain of forts along the Ohio Valley, which would effectually check the westward spread of English colonisation. Dinwiddie, the governor of Virginia, chose W. to act as the agent of the English Government, and confer with the French commander in the Ohio district. The journey was a dangerous and tedious one, and produced no results. In the next year (1754) W. was placed in command of a small military expedition destined to hold the French in check. He commenced the construction of a fort in a strong position at the junction of the Alleghany and Monongahela rivers, where the city of Pittsburg now stands. At first he gained a slight advantage over the French, but his force was too small to cope with them for any length of time, and he was ultimately forced to capitulate, on most favourable terms however, at a place called Fort Necessity, where he had entrenched himself. In spite of the unfortunate result of this expedition, it added to W.'s credit in the colony. When, in 1755, General Braddock was placed at the head of a considerable force sent to operate against the French in the same region, W. joined him as a volunteer, and was present at the disastrous massacre on the Monongahela, where Braddock and most of his army were killed, and where W. himself was the only officer unwounded, though he 'had four bullets through his coat, and two horses shot under him.' A force of 2000 men was now raised for the protection of the frontier, and the chief command was conferred upon W., who fixed his headquarters at Winchester, and for three years performed with credit the arduous and harassing duties of his post. In 1759 he married Mrs. Martha Custis, a wealthy widow, of the same age as himself however, and owning a property contiguous to his own. Resigning his commission about the same time, he devoted himself to the cultivation of his own and his wife's properties, which he conducted with great success. His habits both of life and of business were rigidly methodical, and his accounts and farm reports remain to this day as monuments of his business capacity. His summers were for the most part spent at Mount Vernon, but in winter his duties as a member of the Provincial Assembly called him frequently to Williamsburg. This peaceful and monotonous routine of life continued until the outbreak of the Revolution. By family tradition, by habit of mind, and by his former military life, W. was inclined to the staunchest loyalty, and he seems to have been most unwilling to recognise the necessity of a separation from the mother country. His love of liberty and sense of justice were, however, too strong to render it doubtful which side he would adopt when matters came to a crisis. This they did at Lexington and Concord Bridge on the 19th April 1775. On the 15th of the following June the Continental Congress unanimously chose W. as commander-in-chief of the Continental army, and he accepted the task, far from joyfully, indeed, but with a stern resolve to do his duty in the defence of the endangered liberties of his country. On July 3d he took command at Cambridge of the army besieging Boston, and for the next nine months he conducted the siege, until its triumphant conclusion, 17th March 1776. Not so successful were his next operations in New York and New Jersey. Obliged to witness the defeat of General Putman at Brooklyn from the opposite shore of the East River, driven from New York, and forced to retreat step by step through the Jerseys with a rapidly-diminishing army, he barely retrieved his fortunes by the brilliant skirmish of Trenton, and the subsequent attack upon Cornwallis's army at Princeton. The reverses of Brandywine and Germantown and the British occupation of Philadelphia followed, and during the terrible winter at Valley Forge the fortunes of the Continental cause seemed to have reached the lowest ebb. Yet the British successes had been more apparent than real, and W.'s 'policy of delay,' grounded on the knowledge that, while the king's troops might overrun the country, they could not conquer it, was in reality by far the wisest he could have adopted. The difficulties with which he had at this time to contend were such as to demand for their encounter a fortitude amounting to heroism. His army lacked both clothing and supplies, his treasury was empty, or filled with money worthless through depreciation, a spirit of mutiny was abroad among his troops, the short-sighted meddling of the Congress hampered and galled him, and to crown all, his apparent ill-success was contrasted in the popular mind with the brilliant exploit of Gates at Saratoga, very much to his disadvantage. Still he remained master of the situation. Untiringly active, unmoved by jealousy or petulance, rendered fearless of envy and slander by the proud purity of his motives and conduct, he held on his way with an unswerving confidence such as only the rarest courage can inspire. Gradually matters brightened, and the wisdom of his course was proved. The surrender of Cornwallis at Yorktown, 17th October 1781, crushed the hopes of the British, and the war barely lingered on until the evacuation of New York, 25th November 1783. On the 23d December of the same year W. resigned his command. He at once retired to Mount Vernon and resumed his beloved country occupations, trusting that his public life was at an end. But this was not to be. It soon became evident that a strictly defined and formulated constitution was necessary to prevent the newly liberated country from falling into anarchy. With the politic caution which places him as high among statesmen as he stands among patriots, W. gradually led up to the idea of a Convention for the arrangement of a form of government. The Convention met at Philadelphia in May 1787, and under his presidency it drew up the present United States' Constitution. Unanimously elected by his grateful countrymen to the Presidency of the Republic, W. filled that office for two terms (1789–

1796) with a moderation and sagacity which were perhaps as valuable to the new state as his former military services. He was, in fact, the one man in the country to whom could be entrusted the delicate task of consolidating and establishing the executive machinery. Though privately inclined to what would now be called Republican views, he held the balance between the conflicting parties with absolute impartiality, and did not gratify his longing for rest and privacy until he felt that his part of the work was done, and that he could safely leave its continuance in other hands. His farewell address was issued on the 17th September 1796, when he withdrew to Mount Vernon and resumed the simple occupations of his country life. Scarcely a year had elapsed when his repose seemed likely to be disturbed by a war with France, in preparation for which he was again appointed commander-in-chief of the United States troops. The immediate danger blew over, however, and for two more years he enjoyed the quiet of his favourite home. But on Thursday the 12th December 1799 he was caught in a heavy storm of snow and sleet, and early on Saturday morning he became seriously ill. 'Acute laryngitis' declared itself, and after much suffering he died on the evening of Saturday, December 14th. He had no children, and his property was left to step-children, nephews, and nieces. At the time of his death he owned 124 slaves on his own estate, and probably nearly as many on his wife's. His will directed that they should all be enfranchised on the death of his wife, which occurred three years after his own. He had determined as early as 1786 never to purchase another slave.

W. was one of the few great men of history whose character comes out spotless from the most microscopic examination. To his great qualities as a soldier and a statesman he added all the virtues of private life—integrity and benevolence, piety without narrowness, a genuine if somewhat stiff and formal courtesy. In manners and habits of thought he seems to have been in the best sense 'a gentleman of the old school.' But his great claim to admiration lies in the almost unexampled modesty and simplicity of his character. The successful leader of one of the most wonderful wars on record, in which a handful of disunited colonies shook off the yoke of a great empire, the chief founder of a nation which had already given sure proof of its coming greatness, he not only resisted every temptation to abuse in the slightest degree the advantages of his position, but he even appeared unconscious of the magnitude of the work he had performed. He laboured for his country with a singleness of purpose and absence of self-seeking as rare as they are admirable, and, his task done, he returned simply and with no ostentation to his duties as a private citizen. 'First in war, first in peace,' he deserved, if ever any-one did, to be 'first in the hearts of his countrymen.' Many lives of W. have been written, the best being Marshall's (Philadelph. 1805; abridged 1832), Washington Irving's (New York 1855-59), Everett's (New York 1861), and Jorrault's *G. W., d'après ses Mémoires et sa Correspondance* (Pa.. 1876), while the great storehouse for biographers is the collected *Writings of G. W.* by Jared Sparks (22 vols. Boston 1834-37). A volume of *W.-Crawford Letters* was published by C. W. Butterfield in 1877, and of *W.-Heath Letters* by the Massachusetts Historical Society in 1878.

Wash'ington Terr'itory, the most N.-westerly division of the United States, bounded N. by British Columbia, E. by Idaho, S. by Oregon, and W. by the Pacific Ocean. Area, 79,128 sq. miles; pop. (1870) 37,432, including 13,477 tribal Indians in the reservations, and 1760 other Indians and Chinese. W. T. is divided geographically into two great sections by the Cascade Mountains, which pass through the territory from N. to S., and present to the W. an almost unbroken range of from 5000 to 8000 feet, rising in Mount Rainier to 14,444 feet, in Mount Baker to 11,100, in Mount Adams to 9000, and St. Helen's to 9750. Stretching eastwards is a lofty plateau, dry and sterile, channelled by the fertile valleys of the Yakima, Methow, Okinapum, and other rivers. The Blue Mountains, the summits of this plateau, attain a height of 9000 feet, but sink to 5000 near the Walla Walla. The eastern and greater division of W. T. lies wholly in the Basin of the Columbia River, and is, with the exception of the barren Spokane plains, a pleasant, fertile, diversified country, with plenty of timber. The Columbia enters from British Columbia, receives the Clark just beyond the frontier, and flows in a southerly direction, being joined by the Spokane, Okinikane, Methow, Yakima, Snake River, and Walla Walla. On reaching the Oregon line it turns sharply to the W. and forms the boundary of the territory to the Pacific, a distance of 300 miles. In the western section of W. T., beyond the Cascades, there is a coast range, which extends in irregular masses from the Oregon shore to Cape Flattery, at Juan de Fuca Strait, where it terminates in bold, lofty headlands. The southern part of this range is low, but it has an elevation in Mount Olympus of 8150 feet. The Pacific coast is for the most part abrupt and unbroken; the only safe inlets are Shoalwater Bay and Gray's Harbour. Beyond Cape Flattery, however, the extensive inland sea of Puget's Sound has some of the finest roadsteads in the world. The sound has an area of 2000 sq. miles, and a coastline of 1600 miles, and among its best-known indentations are Bellingham Bay, Hood's Canal, and Admiralty Inlet. There are numerous islands in the sound, which receives many minor rivers. Throughout W. T. are scattered a large number of lakes of considerable size. The Cascade Mountains, and most of Eastern W. T., is of Metamorphic formation. In the N. this gives way to Eozoic, while in the W. the prevailing rocks are Tertiary and Cretaceous. Iron is widely distributed, gold has been found in the N.E., and bituminous coal is mined at various points on Puget's Sound. The forest trees of Western W. T. are unsurpassed in height or beauty except by the giant redwoods and sequoias of California. The red, white, and yellow pine, various firs, and the Oregon cedar, are from 175 to 350 feet high, and from 8 to 15 feet diameter. The deciduous trees are the maple, ash, laurel, alder, &c. Where water is abundant the crops are luxuriant, as much as 85 bushels of wheat being produced to the acre, the wheat weighing 62 lbs. to the bushel. In 1870 only 646,139 acres were farmed, and the crops comprised 217,043 bushels of wheat, 21,781 of Indian corn, 255,169 of oats, 55,787 of barley, 281,144 of potatoes, 15,790 pease and beans, 30,233 tons of hay, 6162 lbs. of hops (200,000 in 1875), 1682 lbs. of tobacco. There was also produced 162,713 lbs. of wool, 407,306 of butter, 17,465 of cheese, and 25,636 of honey. Fruit, flax, sugar, and beets are largely raised, and there is abundance of bunch-grass. The value of live-stock in 1870 was $2,103,343. The chief export is lumber, of which no less than 300,000,000 feet were sawn in the 60 existing mills in 1875. There is considerable flour-milling, and productive fisheries of salmon, halibut, cod, and oysters. In 1878 there were 187 miles of railway in W. T., the chief town of which is Olympus (pop. 1203). The territory was organised in 1853, and reduced to its present limits by the exclusion of Idaho in 1863. A dispute with the English as to the possession of the Puget Sound region, begun about 1828, lingered on for years, and the American claim to the islands in the Gulf of Georgia was not allowed till 1873.

Wash'ington and Lee Univer'sity, at Lexington, Virginia, United States, was originally the Augusta Academy at Grenville, and was chartered in 1782. A grant of stock from General Washington was commuted by the legislature to an interest-bearing fund of $50,000, and this sum has been augmented by gifts of $25,000 from the Cincinnati Society in 1803, and of $40,000 from Mr. J. Robertson in 1826. The institution comprises 13 elective schools, including schools of law, engineering, and applied science. Scholarships are open to divinity students, sons of ministers, intending journalists, teachers, and practical printers, and the foremost pupils of certain high schools and academies. Degrees are only gained by examinations in the several schools. The government is vested in the president and faculty, under a board of trustees. In 1878 there were 300 students and 20 instructors, while the library had 12,000 vols. General Robert E. Lee was succeeded as president on his death in 1870 by his son, General G. W. Custis Lee. There are two other institutions of a somewhat similar name, (1) the University of Washington Territory, chartered in 1860, and organised as a graded school in 1872; (2) Washington University, at St. Louis, Missouri, incorporated in 1852, and having a law school (1867), and the library of the O'Fallon Polytechnic School, containing 30,000 vols.

Wash'ington City, the capital of the United States and seat of the Federal government, situated in the district of Columbia, on the left bank of the Potomac, 106 miles above its mouth, 39 S.W. of Baltimore, 137 from Philadelphia, and 227 from New York by rail. It ranks, in respect of population, twelfth among the cities of the United States, and bears a peculiar character from the circumstance that it was called into existence

to be the seat of the national legislature. After the district of Columbia (q. v.) had been ceded by Maryland as a site for the city, the superintendence of its laying out was left to President Washington and Thomas Jefferson, Secretary of State, by act of Congress of 30th March 1791. A French engineer, Major L'Enfant, prepared the plans, based on the topography of Versailles, and introducing broad transverse avenues, spacious squares, &c. The situation was well chosen—a plateau 100 feet above the river, between Anacostia River and Rock Creek, which separates it from Georgetown (q. v.). To this plateau, Capitol Hill, the ground rises in easy ridges, and to the E., N., and W. extends an amphitheatre of woody hills. Originally called the 'Federal City,' it received its present name from the commissioners. The grand scale of the design left it little more than a design for many years, during which it was known as 'the city of magnificent distances.' No street was less than 70 feet wide, while some were 160, and the aggregate length of the streets is at present 264 miles. The avenues, 21 in all, are named after the various States, and the principal one, Pennsylvania Avenue, is a magnificent thoroughfare, 130 feet wide, reaching from the Anacostia, past the Capitol and the President's House, to Georgetown. It consisted originally of three roadways, with a double row of Lombardy poplars, but these trees were cut down in 1832, and the roadway thus broadened was paved in 1876 with concrete, and is acknowledged to be the finest drive in the country. The Massachusetts Avenue has a length of 4½ miles. Among the many parks and open places are the Capitol grounds, 52 acres; President's grounds, 20; La Fayette Square, 7; the Park or Mall (not yet fully opened, 1879), 100; Judiciary Square, 19; the Arsenal grounds, 44½, and the Navy-Yard, 27. The city in all covers 6111 acres, or 9½ sq. miles, having a frontage on the Potomac of 4 miles, on the Anacostia of 3¾. The proportion of land unbuilt on, which exceeds that perhaps of any other city, has greatly influenced the public health, and the death-rate is as low as 2 per cent. The city is divided into four sections, and the streets, on the 'Philadelphia plan,' are, within each section, called either by the letters of the alphabet, or by numbers, from First to Twenty-Eighth, according as they run E. and W., or N. and S. The principal building is the Capitol, a freestone edifice, which was erected in 1818–25, and to which two immense wings in white marble were added, 1851–59. Its entire length is 751 feet, its greatest depth 324 feet, its height to the roof 70 feet, its area 3½ acres. Its front has 68 Corinthian columns, and from the centre springs a great iron dome, crested with a statue of Freedom (1863), at a height from the ground of 285½ feet. The entire cost of the structure was $13,000,000. The interior of the Rotunda is adorned with frescoes by Brumidi, Trumbull, Vanderlyn, Weir, and Powell, and the façade and portico with sculptures by Crawford, Greenough, and Persico. The Senate Chamber, in the N. wing, is 113 by 81 feet, with seats for 76 senators and 1000 spectators. The S. wing is occupied by the House of Representatives, 139 by 93 feet, and seated for 300 members and 1500 others. The Library of Congress, which receives a copy of all publications, comprises over 310,000 vols. (35,000 law). The old Senate Chamber, in the central building, is now the Supreme Court, and the old Hall of Representatives, a fine semicircular chamber, was made a National Memorial Hall by an Act of 1864. Other important buildings are the Treasury Department, an Ionic structure with monolithic columns 31½ feet high, erected (1836–64) at a cost of $6,000,000; the Patent Office (1837–64; partly destroyed by fire, 1877), in pure Doric, with three fronts of Maryland marble; the Post Office (1855), in Corinthian style, with a frontage of 300 feet; the ornate, brick-built Agricultural Department (1868), situated in beautiful grounds 10 acres in extent; the Naval Observatory (1844), with an electric time-signal and great equatorial telescope (1873), the object-glass, one of the largest in the world, being 26 inches, and costing $47,000; and the Army Medical Museum, containing valuable archives and a library of 40,000 vols. The President's House, or White House (1818–29), is a plain Ionic freestone edifice, painted white, and standing in grounds adorned with fountains and shrubbery. The new building for the State, Navy, and War Departments (begun 1871, and not finished 1878), a massive Renaissance structure, with a Mansard roof, has a length of 567 feet, and a breadth of 471. It is entirely of granite, and will cost $7,000,000. The Washington National Monument, begun in 1848, came to a stand-still when 174 feet of the column had been raised at a cost of $230,000. In 1876, however, Congress appropriated $200,000 to its completion as a plain obelisk, 70 feet square at the base, and 470 feet high. W. C. has few good monuments; one of the best is Bell's statue emblematic of Emancipation (Abraham Lincoln unfettering a slave), erected in 1876. There are in all 120 churches, but they are inferior in architecture to the hotels and boarding-houses scattered throughout the city. There are numerous scholastic and benevolent institutions, the former comprising the Smithsonian Institution (q. v.), the Columbian University, Gonzaga College (Roman Catholic), Howard University for coloured youths, and the law school of the National University. W. C. publishes 5 daily and 12 weekly journals, and the places of amusement include a good theatre and opera-house. A water supply of 80,000,000 gallons daily can be procured by means of an aqueduct (cost $3,500,000) from the Great Falls of the Potomac, 16 miles above the city. W. C. is connected with the Virginian shore by 3 bridges across the Potomac, which is here a mile wide. There is little trade and less manufacture, but as a political focus the city is maintained in prosperity by a constant influx of visitors, many of whom are attracted by the genial climate and the gay social life. Pop. (1875) 125,000, of whom 73,731 are white, 35,455 coloured, and 13 Indians. Founded in 1791, W. C. was little else than a gigantic failure for more than half a century. In 1839 George Combe wrote that it looked 'like a large straggling village reared in a drained swamp.' Down to 1871 the grounds and avenues were sadly neglected, but in that year Congress, having abolished the municipal governments of W. C. and Georgetown, and created the district of Columbia a territorial government, an enterprising Board of Works was established, which by 1876 had created a public debt of $25,000,000, the cost of improvements, including the paving of 160 miles of streets, and the planting of 29,000 trees. During the Civil War, W. C. was several times in danger of attack, and was protected by an immense cordon of earthworks. It served as a great military depôt, and most of its public buildings, including the Capitol, were converted into temporary hospitals. On Arlington Heights, on the Virginian shore, are the graves of 15,000 Union soldiers.

Wash'ington, a town of Missouri, U.S., on the S. bank of the Missouri River, 54 miles W. of St. Louis by rail. It lies on a high ridge running parallel with the river, on which a steam-ferry plies. There are seven churches, one of the finest being the Roman Catholic church of St. Borgia. Prominent among the public buildings is the Jeffries High School, a Catholic institution. W. has a large trade in agricultural produce, and its industries comprise steam, flour, and saw milling, beef and pork packing, tanning, &c. Two rich deposits of fire and potter's clay are extensively wrought, and large quantities are shipped to St. Louis. Pop. (1870) 5614.

Wash'ita, or **Ouach'ita**, a river of the United States and an affluent of Red River, flows in a S.E. direction through Arkansas and Louisiana, draining a rich cotton and corn country for a distance of 600 miles. It receives the Saline River, La Fourche, Tensas, and Little Missouri, and is navigable throughout the year by steamboats to Camden, a distance of 300 miles. The *False W.* traverses the Indian territory, and joins the Red River above Preston, in Texas.

Wasp, the name applied to various species of *Hymenopterous* insects of the family *Vesparia* (Latreille). The body is slender, and the antennæ are elbowed or bent. The mandibles are large, and the maxillary palpi 6-jointed. The wings are long and narrow, and the hind shanks and tibiæ of the legs smooth. The larvæ are fleshy grubs. In the wasps we find *social instincts* frequently exemplified, as in the bees. The higher wasps build papery nests, but lower genera may burrow in the ground. The genus *Vespa* includes typical species, such as *V. maculata* and *V. arenaria* (the latter the yellow W.), both of which construct papery nests in the form of galleries, the opening of the nest pointing downwards. *V. Orientalis* builds cells of clay. The Hornet (q. v.) is merely a species of W. Wasps live upon other insects, and spoil and pillage other species of Hymenoptera. They attack honey bees, and are known to destroy flies and butterflies. They are destructive to fruits, and will even devour raw meat. The jaws and not the sting form their chief organs of attack.

The Wood wasps and Sand wasps form the family *Crabronidæ*, in which the head is large and of carboidal form, the fore feet

adapted for digging, and the larvæ short and thick. These wasps make their nests in rotten wood, or in the soft parts of plants.

Waste, in English law. See COMMON; IMPEACHMENT OF WASTE; DILAPIDATION; TENANT FOR LIFE; TIMBER, LAW REGARDING. A strip of W. land adjoining a highway belongs to the owner of the adjoining soil.

Waste Land, a term applied to land not brought under tillage, though capable to some extent of cultivation, in countries whose agricultural produce is inadequate for the wants of the population. In the United Kingdom, for example, of the 77,828,947 acres constituting its area, only 47,326,615 were in 1878 enclosed and cultivated, the remainder being distributed in woods and plantations, uninclosed pasture, moorlands, heaths, downs, peaty and marshy lands, and hilly wastes. Considerable portions of this W. L. are from altitude or unfavourable climatic conditions hopelessly unimprovable; other parts could be rendered productive at an excessive outlay, but would scarcely prove remunerative; still many large tracts—estimated in the aggregate at about 16,000,000 acres—might with enterprise and skill be profitably added to the food-producing area of the kingdom. Several hundred thousand acres have been reclaimed during the present century. The means adopted for the reclamation of W. L. vary with the nature and situation of the soil. The principles of draining, trenching, liming, and fencing are general. Stony ground is trenched with the spade, as the plough cannot be advantageously employed. Mossy lands are treated with large quantities of clay, sandy earth, or marl, to afford firmness, while most reclaimed land is the better of an application of lime. Irrigation is useful for some lands, and with the subject of reclaiming W. L. that of the profitable utilisation of sewage is intimately associated.

Wast'ing Pal'sy is one of the terms applied to *Tabes Dorsalis* (q. v.).

Wast'water, in Cumberland, the seventh largest of the English Lakes, lies 14 miles S.S.W. of Keswick, from which it may be gained by the steep Sty Head (1560 feet) or the Black Sail Pass (1690 feet). Shut in by rugged mountains, among them Scafell Pike (3208 feet), the highest point in England, W. presents an aspect of wild and gloomy grandeur. It is 3 miles long by half a mile wide, and has a depth of 270 feet.

Watch. The invention, sometime during the reign of Louis XI., of a *main-spring* as a substitute for the weights suspended by cords hitherto employed to drive the train of a clock, was the first step towards the construction of a pocket-timepiece, known as a W., for it then became possible to reduce a time-measurer to portable dimensions. Watches were probably first constructed at Nürnberg early in the 16th c.; at least among the earliest known are the 'Nürnberg animated eggs,' so called from their ovoid shape. They have wheels of steel, De Wick's 'verge' escapement, and an hour hand only. The *fusee* was invented about 1530 to equalise the varying force of the mainspring. At first it was connected by a catgut cord with the barrel enclosing the mainspring, but about 1665 a chain was substituted. Fanciful forms were common among early German and French watches, and sometimes rock crystal was chosen as a material for the cases in order to display the mechanism. Flat circular forms were introduced about the time of Louis XIII. In 1658 Hooke in England and Huyghens in Holland simultaneously applied a coiled spring to the balance-wheel to control its vibrations, accomplishing for it the part that gravity plays in the pendulum. Repeating watches were invented by Barlow in 1676. Quare shortly thereafter added a minute hand, and about 1700 Facio of Geneva introduced the practice of setting the pivots in jewels. Of the subsequent mechanical improvements which mark stages in the progress towards the production of a perfect time-keeping W. may be mentioned the horizontal escapement of Graham, the going fusee of Harrison, the lever escapement of Savage and others, and the chronometer escapement of Arnold and Earnshaw, besides the numerous compensation devices applied to the balance-wheel or balance-spring for the purpose of correcting irregularity in the vibrations of the latter arising from its expansion and contraction through changes of temperature. In 1764 Harrison gained a premium of £20,000 offered by the English Parliament for a chronometer sufficiently accurate for purposes of navigation. See HOROLOGY.

W.-making is an important industry in England, Switzerland, France, Germany, and the United States. London is unrivalled for the production of watches of the highest quality. Lancashire, Prescot, and neighbourhood produce about 120,000 movements yearly, partly by the aid of machinery, which was introduced in 1866. Coventry, Birmingham, and Liverpool are also manufacturing centres. The fusee and lever escapement are features of the ordinary English W., which is famed for durability and accuracy. The watches manufactured in France at Besançon and the immediate neighbourhood, and in Switzerland at Neuchâtel, Locle, &c., are characterised by lightness, good timekeeping qualities, and cheapness. They have a 'going barrel,' which renders a fusee unnecessary, and a horizontal escapement. The minutest subdivision of labour is practised. In Switzerland 40,000 persons are engaged in the industry, each of whom makes on an average forty watches annually. Till late years the Swiss held the markets of the world for cheap watches, but the competition of Besançon and especially of the United States have seriously diminished their exports. In the construction of complicated watches, such as repeaters, the Swiss have no rivals. Since 1850 W.-making has developed in a remarkable manner in the United States. The leading principles of the industry are great simplicity of mechanism consistent with perfect reliability in time-keeping, and the use of labour-saving machines. The fusee and chain are discarded, a wide and free motion of the esochronous balance-spring having been found sufficient to govern and equalise the movement of the train. The movements and other parts of a W. are made by specially contrived machines, to a great extent automatic, by which great precision and uniformity are attainable. The corresponding parts of watches of the same grade are accordingly interchangeable. The idea of using machinery originated with Dennison and Howard, working watchmakers of Boston, and they first carried it into practice at Roxbury in 1850. Half-a-dozen factories are now in operation in the United States; the two principal are those of the Waltham (Massachusetts) Company, employing 900 persons, half of either sex, and the Elgin (Illinois) Company (700 persons). Here 375 movements are made daily; and whereas in England and Switzerland one man can produce only 40 watches a year, at Waltham 150 are turned out per man. The total annual product of the Waltham factory is upwards of 100,000 W.-movements, 50,000 silver cases, and 18,000 gold cases, and the value of the whole exceeds $2,000,000. It is only in the American factories that the complete parts of a W. are made and put together under one roof.

W. cases of British manufacture must be assayed and stamped at the Goldsmiths' Hall, London, or at some provincial hall. The large number of 32,888 gold and 112,323 silver cases were marked in London during the year ended 29th May 1875.

W. dials that are luminous in the dark have recently come into vogue. The luminosity is due to a coating of a phosphorescent body, such as sulphide of barium or sulphide of calcium, which is attached to a paper or cardboard dial by means of adhesive varnish. See Denison's *Rudimentary Treatise on Clocks and Watches* (new ed. 1867), and Schilling-Baumann's *Ueber Uhren; deren Geschichte und Behandlung* (Zür. 1875).

Watch, the term used to indicate the portions of time into which the night is divided for sentinel duties. Hence, as on shipboard, the word is applied to the sections into which the crew is divided for such purposes.

Wat'er, the most widely distributed of all minerals, exists at ordinary atmospheric pressure and temperature as a clear, limpid liquid, entirely free from taste or smell, and with neither an acid nor an alkaline reaction. Though colourless in small quantity when pure, it has a distinctly blue colour when viewed in mass. In its liquid form W. covers about three-fourths of the surface of the globe, besides permeating the porous strata which form the earth's crust. Its density, which in the liquid state is about 770 times that of the atmosphere, varies with the temperature, attaining a maximum at 4° C. When the barometer column stands at a height of 760 millimeters (29·922 inches), the weight of a cubic centimetre of water at this maximum temperature equals the weight of 1 gramme, so that a *litre* of water at 9° and 760 mm. pressure weighs a *kilogramme*. Under the same barometric pressure, W. freezes at 0° C. and boils at 100 C.; indeed, it is by these changes of state that the two standard temperatures of all our thermometric scales are deter-

mined. (See THERMOMETER.) In the act of melting ice contracts, and hence, in accordance with the dynamical theory of heat, the freezing point of water or the melting point of ice is lowered by increase of pressure. (See ENERGY, GLACIERS, THERMODYNAMICS.) On the other hand, W. expands when becoming steam, so that its boiling point is raised by increase of pressure. In its liquid form W. is slightly compressible, so slightly that it long resisted attempts to measure its compressibility. For an additional atmosphere of pressure its volume is reduced ·000047, or by about one twenty-thousandth part. According to Perkins, its volume is reduced by $\frac{1}{12}$th under 200 atmospheric pressures. Its specific heat is greater than that of any other known substance, and is the unit in terms of which the specific heats of other substances are expressed. For this reason W. is valuable as an equaliser of temperature, since the change of temperature produced by absorption or abstraction of heat is smaller than the corresponding change for any other substance. Not only so, however, but in converting it into ice or steam, during either of which processes no change of temperature occurs, a large quantity of heat is evolved or disappears, being transformed from or into a less evident form of energy. Thus, in converting W. into steam, 5·37 times as much heat is used as is required to raise the same mass of water from 0° C. to 100° C. W. vapour is always present in the atmosphere; and for every temperature there is a definite maximum quantity which the atmosphere is able to retain. (See VAPOUR.) If the atmosphere is dry, *i.e.*, does not contain its maximum quantity of vapour, the W. filling the oceans, lakes, rivers, streams, &c., is undergoing evaporation, and must therefore be cooling in order to supply the heat which must disappear so that this evaporation may take place. On the other hand, if the atmosphere is saturated there is no evaporation; but if the temperature of the air falls, precipitation takes place in the form of rain, mist, dew, snow, or hail. This condensation of vapour is accompanied by an evolution of heat; and hence, generally, whatever change of temperature the atmosphere suffers, the corresponding changes produced in the condition of the atmosphere as regards the W. vapour which it contains tend to resist by their thermal effects the original variations in temperature. The various conditions under which the moisture in the air is precipitated are noticed under CLOUDS, DEW, RAIN, HAIL, and SNOW. See also RIVER and SEA for details regarding W. in its geological relations as a destructive and conservative agent.

Chemically, W. is a compound of hydrogen and oxygen, being represented by the formula H_2O or HOH. By the ancients it was supposed to be one of four elements of the physical universe, and its compound character was not proved till Cavendish in 1781 produced it synthetically by the explosion of a mixture of hydrogen and oxygen. Watt also claimed to have discovered the true nature of W.; and after the death of both, a bitter controversy continued for a long time regarding their respective claims. There seems no doubt that Cavendish had the priority, though very probably Watt made his researches independently. W. is thus really an oxide of hydrogen, resembling in constitution either oxide of potassium (K_2O), or caustic potash (KOH). As already noticed, however, it possesses neither acid nor basic characters. With strong acids such as anhydrous sulphuric acid or anhydrous nitric acid it forms definite compounds (H_2SO_4 and HNO_3), which retain strong acid characters; while it combines similarly with strong bases forming definite compounds, such as caustic potash (KOH) or caustic soda (NaOH), which also retain their alkaline properties. These hydrated acids or bases, however, have the same constitution as the salts which result, if instead of indifferently basic or acid W. a strong acid or base is substituted. This view of the action of W. is interesting as showing how difficult it is to draw a hard and fast line between the three groups of compounds, salts, bases, and acids, which are recognised in chemistry. The real chemical nature of W. is still far from being understood, notwithstanding that it is the most common of all known compounds. Even in the simpler cases of mere solution, it is as yet impossible to say definitely what is going on. The fact that many strong undiluted acids do not act upon bases so readily as they do when slightly dilute, indicates the great importance of W. in aiding chemical action; and the so-called W. of crystallisation, which must be present in many salts before they can take the crystalline form, bears intimately upon the same question. Though the compound character of W. was first demonstrated by synthesis, it is much more convenient now to demonstrate it by analysis, *i.e.*, to break it up directly into its component parts. This dissociation may be effected by raising steam to a high temperature, or by passing steam over red-hot iron, which absorbs the oxygen and lets the hydrogen pass over. Electrolysis (q. v.), however, affords the readiest means at our disposal to effect this decomposition. After adding a little acid to improve the conducting power of the W., a current is passed through the liquid, and hydrogen and oxygen are given off, the former at the electrode by which the current leaves the liquid, the latter at that by which the current enters.

Wat'er-Bed, Hydrostat'ic Bed, or **Float'ing Matt'ress,** devised by Dr. Neil Arnott, one of the Queen's physicians, consists of a trough of the dimensions of a wide sofa or a bed, having 6 or 7 inches depth of water in it, and over it a caoutchouc covering on which clothes and pillows are laid as in a common bed. A more convenient and portable contrivance is the Water Mattress, consisting of a caoutchouc or waterproof bag of the size of an ordinary mattress, which may be filled with water of any degree of temperature, or with air, as may be desired. The W.-B. is exceedingly useful in many diseases, but it is frequently a considerable time before the patient can become accustomed to its use, and some can never be reconciled to it. A person weakened from disease often suffers considerable pain from pressure, and it is necessary for the comfort of the patient that his position be changed frequently. This is in great measure obviated by the W.-B. In other cases sensation is blunted, and the patient remaining for lengthened periods in one position, surfaces exposed to long-continued pressure are apt to slough, causing bed-sores, and such may only be discovered accidentally. In such cases the W.-B. relieves the pressure, and thus prevents the formation of bed-sores. In all diseases in which the patient is confined long to bed, as in lingering consumption, paralysis, disease of the spine, and fevers with delirium, the W.-B. is of great value.

Wat'er-Brash. See PYROSIS.

Wat'er Bug (otherwise 'Water Scorpion and 'Water Boatman'), the name given to a section of the *Hemipterous* family *Notonectidæ*. The hind legs are long, and adapted for swimming. The body is prismatic in form, convex above and flat beneath, and the head is as large and as wide as the body. The antennæ are four-jointed. *Notonecta* is the typical genus of the family. To the allied family *Nepidæ* also belong species of the W. B. more especially named 'Water Scorpion.' *Nepa cinerea* is a familiar species. In *Nepa* the body terminates in a long breathing-tube, and the antennæ are three-jointed. The W. B. is predaceous, living chiefly on the larvæ of other insects.

Wat'erbury, a city of Connecticut, U.S., 88 miles N.E. of New York by rail. It has eleven churches, a city hall, a large public hall, and a library of 18,000 volumes. W. supports one daily and two weekly newspapers. There are manufactures of brass, iron, copper, and other metallic goods. The city possesses waterworks of great size. Here the co-operative system has always largely prevailed, and there are about thirty joint-stock companies with a capital exceeding £1,200,000. Pop. (1870) 10,826.

Wat'er-Cal'trops and **Wat'er-Chest'nut.** See TRAPA.

Wat'er-Col'ours are pigments carefully ground up with water and isinglass or other mucilage instead of oil. They are prepared in the form of small cakes dried hard, or kept moist by the addition of honey. See PAINTING.

Wat'er-Cress. See CRESS.

Wat'er-Dog, a variety of the Dog having a curly coat, long ears, a rounded head, and webbed toes. It seems to be allied to the Poodle (q. v.), but differs from the latter in its firmer set and stouter body, and in its larger size. The W. D. is highly intelligent, but less so than the Retriever (q. v.). It is usually of a greyish white varied with black and brown.

Wat'er-Drop'wort (*Œnanthe*), a genus of glabrous herbs, often aquatics, belonging to the natural order *Umbelliferæ*. There are about 20 species, distributed through N. temperate regions, S. Africa, and tropical Australia. In this genus the leaves are much divided, and the umbels compound, generally

without a common involucre, but with partial involucres of many narrow bracts. The fruit is cylindrical or ovate, and the carpels marked with five convex ribs, between which, within the rind, run as many vittæ. *Œ. crocata* is a rank poison, of varying intensity. It is a common plant of marshes, ditches, &c., through Britain, and numerous fatal accidents have occurred from its thick, whitish tubers being mistaken for the root of the parsnip, or the plant itself for celery. *Œ. phellandrium*, the fine-leaved W.-D., is less poisonous.

Wateree′, a river of N. and S. Carolina, United States, rises in the eastern part of N. Carolina, and flows direct S. to Fort Mott, where it unites with the Congaree to form the Santee. It is navigable to Camden, 200 miles from the sea. Above Fishing Creek in N. Carolina it is called the Catawba.

Wat′erfalls are formed by a sudden change in level of a river's bed, so that the water pours vertically downwards in a more or less unbroken sheet. They are most frequent in mountainous districts, where, however, they are generally small as regards their volume of water, and present very different aspects according to the season of the year. The most magnificent known W., those of Niagara, the Congo (Livingstone), the Zambesi, &c., are situated in comparatively level country, and their grandeur is due to the immense and steady volume of water which is precipitated several hundreds of feet. At the base of the fall a fine spray is always kept in suspension, which in certain lights displays gorgeous rainbow tints. Geologically, the action of a waterfall is very similar to the action of rivers in general, wearing away the channel through which it flows and the ledge over which it is precipitated. All W. therefore tend to retreat up the river's course, the rate of erosion of Niagara being for example, according to Lyell, about 1 foot annually. Of the more remarkable falls we may specify, besides those mentioned, the Tequendama Falls in Colombia, S. America (476 feet high and 38 feet broad), the Yosemite Falls in California (an unbroken fall of 5500 feet, and a total fall of 6600), the Gerseppa Falls of the West Ghauts, near Honawar (in four cascades, the first of which is 884 feet high), the Kaveri Falls near Madras (368 feet), the Missouri Falls in N. America (a series of cascades with a total fall of 357 feet), the Staubbach Falls in Switzerland (998 feet), the Rheinfall near Schaffhausen (60 feet high and 380 feet broad), the Gavarnie Falls of the Pyrenees (1325 feet), and the Orco Falls at Monte Rosa (2400 feet).

Wat′er-Flea, the name given to various small genera of *Crustaceans*, belonging to the order *Entomostraca* (q. v.), and to various sub-orders of that group. It is common in freshwater ponds and brooks, and lives in pure, potable waters (see CYPRIS and CYCLOPS). The *Daphnia pulex* is the 'Branch-horned W. F.,' and may be readily recognised by its large and biped antennæ. The body is enclosed in a bivalve shell, but the head is distinct. The gills are attached to the five pairs of thoracic legs. The large antennæ serve as swimming-organs.

Wat′erford, an Irish maritime county in the province of Munster, bounded W. by Cork, N. by Tipperary and Kilkenny, E. by Wexford, and S. by the Atlantic. Area, 461,552 acres; pop. (1871) 123,510, of whom 96,235 were Catholics, while 3821 spoke only Erse, 43,516 both Erse and English. Mountains, containing slate and quartz, attain an elevation of 2609 feet, and are parted by valleys belonging to the limestone series, while the principal rivers are the Suir and Blackwater. Rich pastures alternate with marshes and good light land, and the climate is moist, the rainfall of 1877 being 51·82. Of 90,581 acres under crops in 1878, 13,441 were in wheat, 25,006 in oats, 1652 in barley, bere, and rye, 14,393 in potatoes, and 23,929 in meadow and clover, while woods and plantations covered 20,158 acres in 1877. The live stock included 13,948 horses and mules, 4324 asses, 93,732 cattle, 66,724 sheep, and 53,325 pigs in 1878, when the rateable valuation of W. was £316,665. Copper-mining, quarrying, and the cotton manufacture afford some employment, but fishing (1101 men and boys in 1878) and agriculture are still the staple industries, though both have declined with the fall in the population, the number of emigrants being 66,483 during 1851–77. W. and Dungarvan are the only towns in the county which return two members to Parliament.

Wat′erford, the capital of the preceding county, itself a county of a city, stands on the right bank of the Suir, and is connected with its N. suburb of Ferrybank, by a bridge 832 feet long. Of six Catholic places of worship, including a cathedral, the finest is the Dominican church of St. Saviour, erected (1878) in the Italian style at a cost of £11,000; and the Protestant Episcopalians have also a cathedral and two churches. Other buildings are the Protestant Episcopal palace, the Catholic College of St. John, St. Dominic's Industrial School (with 120 inmates in 1876), four convents, a town-hall, market-house, &c. Up to 1871, £23,000 had been expended in deepening the channel of the Suir, whose southern bank is fringed for a mile by a spacious quay, while on the Kilkenny side is a shipbuilding yard, with a patent slip, graving-bank, and dock. In 1878 there entered the port 2536 vessels of 675,397 tons, and cleared 2527 of 673,539 tons; and in 1877 the imports amounted to £676,599, the customs to £62,976, and the imports (chiefly agricultural produce) to £13,527. Besides two immense bacon-curing establishments, W. has iron-foundries, flour-mills, breweries, &c. It publishes nine newspapers, and returns two members to Parliament. Pop. (1871) 23,349, of whom 20,604 were Catholics and 1861 Protestant Episcopalians. A memorial of W.'s foundation by the Dane's in the 9th c. is 'Reginald's Tower' (1003), which has witnessed the city's capture by Strongbow (1170), the repulse of Cromwell and surrender to Ireton (1649–50), and the embarkation of James II. after the Battle of the Boyne (1690).

Wat′er-Glass consists of a compound of silica (quartz or pure sand) and either or both of the alkalies soda and potash. The silica and alkaline substances are melted together as in the manufacture of glass, and the resulting compound is a transparent glassy mass differing only from ordinary glass in the circumstance that it is soluble in water, whence the name W.-G. or soluble glass. Its solution has many important applications in the arts, being used in calico-printing as a 'dung substitute,' as a substance for rendering paper, textiles, and wood uninflammable, for preserving wood, for mixing with pigments, and for the preparation of a mineral cement and artificial stone. It also plays an important part in the art of stereochromy in the preparation of mural decorations and paintings, which are practically unaffected by exposure to all atmospheric influences.

Wat′er Hemlock. See HEMLOCK.

Wat′erland, Daniel, D.D., 'the most learned of contemporary divines', was born in Lincolnshire, 14th February 1683, studied at Cambridge, became master of Magdalen College, Chaplain to George I., and Canon of Windsor. He died 23d December 1740. W. was an able and zealous defender of the orthodox faith against the English Deists and other 'infidels' of the period. He builds principally upon the historical argument. His writings are entirely controversial: the chief are *A Vindication of Christ's Divinity, being a Defence of some Queries relating to Dr. Clarke's Scheme of the Holy Trinity* (1719), followed by a second (1723) and third (1725) Vindication; a *Critical History of the Athanasian Creed* (1724), also directed against Clarke; *Christianity vindicated against Infidelity* (in three parts, 1730–32), a reply to Tindal's 'Christianity as old as the Creation;' and a *Review of the Doctrine of the Eucharist* (1737), directed against Hoadley's rationalistic interpretation of that ordinance. A complete edition of W.'s works, with a Life by Bishop van Mildert, was published at Oxford (11 vols. 1823–28; new ed. 6 vols. 1843). See Abbey's *English Church in the 18th c.* (Lond. 1879).

Wat′er-Lil′y, a current name for several well-known species of aquatic plants belonging to natural order *Nymphæaceæ* (q. v.). The white W. L. (*Nymphæa alba*), which has a wide distribution in the N. hemisphere, is frequent in lakes, ponds, and water-courses throughout Britain, its large and chaste flowers claiming precedence for beauty among the indigenous flora. *Nymphæa lotus* has similar flowers but tinted with pink, and has strongly-toothed floating leaves; it is the white lotus of the Nile. The blue lotus (*Nymphæa cærulea*) has fragrant blue flowers. Several species and numerous varieties of W. L. are in cultivation as ornamental plants, including the above and *Nymphæa odorata* of N. America. In India the seeds are used as food. In the allied genus *Nuphar* the flowers are yellow, and the common species (*Nuphar luteum*) is known as the yellow W. L. It is a frequent British plant of still waters. The flowers are fragrant with an alcoholic odour, hence its further name of 'brandy bottle.' The rootstock abounds in tannic acid. See LOTUS and VICTORIA.

Waterloo', the Belgian village of Brabant, 12 miles S.E. of Brussels, where on 18th June 1815, two days after the actions of Ligny (q. v.) and Quatre Bras (q. v.), Napoleon with 72,247 Frenchmen was defeated by Wellington's army of 69,894 men (25,389 British, 10,995 Hanoverians, 17,488 Netherlanders, &c.). The battle (by Frenchmen named after the village Mont St. Jean, the key of the British position; by Prussians after the farm of La Belle Alliance, the French centre) lasted from 11.30 A.M. till 7 P.M., Bülow bringing up by 4.30 P.M. the first of Blücher's 45,000 Prussians, in time to convert into a glorious victory what otherwise had been a drawn engagement. The loss of the Allies was 23,185 (1120 officers, 11,678 British and Hanoverians, 6999 Prussians, &c.), that of the French 18,500 (32,000 by some accounts), with 7800 prisoners and 227 cannon taken. See, besides works cited under NAPOLEON I. and WELLINGTON, General Mercer's *Journal of the W. Campaign* (2 vols. Edin. 1870); Colonel Chesney's *W. Lectures* (3d ed. 1874); Königer's *Krieg von* 1815 (Leip. 1865), and De la Tour d'Auvergne's *Étude de la Campagne de* 1815 (Par. 1870).

Wat'er-Mel'on. See MELON.

Wat'er-Ou'sel. See DIPPER.

Wat'er-Power. Under this heading we conveniently consider the various means by which the energy of moving water may be utilised. To make such a source of energy effectual, it is necessary and sufficient to have the water falling from a higher to a lower level; in other words, the water must have what is technically called a 'head.' Such conditions more or less favourable exist in all streams, though in many cases the fall is so slight and therefore the velocity of the water so small that practically no useful work can be obtained. In such case, by the construction of dams or otherwise, the energy may be stored up as potential energy in a large mass of water to be transformed at will. Even where the stream is one which is directly available for performing useful work, it is usually advisable to collect the water in reservoirs, since the quantity of flow of most streams varies considerably with the seasons. Even with such precautions the supply of water may be far from uniform, overflowing the dams in the wet season and hardly filling them in the dry. Given the available fall and the total quantity of water which flows in a given time, the potential energy which is lost is expressed in foot-pounds by the product of the mass in pounds multiplied by the height through which the water has fallen. This energy is mainly transformed into the kinetic energy of running water, while part is transformed into heat and sound. If the former portion could be wholly transformed into useful work, the water would be brought to rest; but as this is never practically realised, we see that the *available* energy of a fall of water is much smaller than the total transformable energy. Of the various machines by which the necessary transformation is usefully effected, the most common are what are known as waterwheels, in their several forms of turbines, undershot wheels, breast wheels, and overshot wheels. The last three are very similar in construction, and are made to rotate round a horizontal axis by the action of the water upon the floats which are fixed at equal intervals more or less radially round the circumference of the wheel. In the *overshot wheel*, which is applicable to falls of from 12 to 60 feet, the water is received in the bucket-shaped partitions in the circumference, and by its weight, aided in some measure by the initial impact, drives the wheel round, the upper part moving in the direction of the flow of water. The water escapes below as each partition during the rotation of the wheel is turned face downwards. The *breast wheel* acts very similarly, and is applicable to falls smaller than those for which the overshot wheel can be conveniently used. The upper circumference of the wheel is higher than the feeding channel of the water, which enters at a point usually a little above the centre of the wheel. The *undershot wheel* is used where the momentum only of the current can be utilised, the impact of the water upon the floats forcing the wheel round. There is necessarily a considerable waste of power in the undershot wheel, which was to a certain extent remedied by Poncelet when he introduced curved instead of plane floats. The *turbine* or *vortex-wheel* is usually horizontal, rotating round a vertical axis. In the original form of turbine, invented by Fourneyron in 1823, water was introduced from above into a central chamber, from which it radiated through curved radial chambers. From these it was projected upon the curved floats of the wheel, which was forced round by the reaction of the escaping water. The principle of the action is the same as that of Barker's Mill (q. v.). In all forms of turbines the essential parts are—(1) fixed vanes, called guides, for giving direction to the water; (2) vanes at the circumference for receiving the water; (3) a gate for regulating the quantity of water, and therefore the velocity of the wheel; and (4) a shaft for transmitting the rotatory motion. Besides the outward-flow turbines, like that described above, in which the guides are *inside* the wheel, there are also inward-flow turbines, which have the guides *outside*, and the parallel-flow turbines, in which the guides are *above* the wheel. In the turbine both the direct impulse and the reaction of the water are utilised; and in this way the turbine has decided advantages over other forms of waterwheels. Though it is from rivers and streams that we derive all the W. P. which is profitably used, there is no doubt that in the tides we have a great and remarkably constant source of energy, if it could be utilised. Suggestions have not been wanting as to methods for utilising this energy, but as yet nothing practical has resulted.

Wat'erproofing. The process of rendering any substance impervious to water. W. is mainly applied to woven fabrics, and is most effectually accomplished by the use of vulcanised indiarubber (see CAOUTCHOUC). Garments of cloth covered with indiarubber possess the drawback of being also impervious to air; the disadvantage has to some extent been removed by perforating the garment in parts concealed from sight. Ballard's process for W. fabrics without making them airproof consists in immersing the cloth in a solution of acetate of alumina and drying in a current of air. Clamond of Paris has recently patented the application to cloth of a solution of paraffin, the solvent being afterwards driven off by heat. Mr. Berthon's recipe for W. and airproofing canvas for his collapsing boats is as follows: To 6 oz. of hard soap add 1½ pints of water, and when boiling add 5 lbs. of ground spruce ochre, ½ lb. patent driers, and 5 lbs. boiled linseed-oil. Greater flexibility is obtained by omitting the ochre. The Chinese use a composition of boiled oil, soft soap, and beeswax for W. calico, which when so treated withstands the effects of climate and rough usage much better than European waterproofed fabrics.

Wat'er Scorpion. See WATER-BUG.

Wat'ershed. See RIVER.

Wat'erspout, a phenomenon frequently observed at sea, is caused by the descent of a vortex of cold air condensing the moisture in the stratum through which it penetrates, so that the clouds appear joined to the sea by a column of water. It is therefore a whirlwind upon a small scale. See WINDS.

Wat'er-Supply'. It is an obvious fact that the command of an abundant and pure supply of water is a prime necessity to the health, prosperity, and increase of any community. While a population is small in proportion to the area it occupies, the difficulty of procuring a sufficient supply is usually small, but as the inhabitants increase in number, in a rapidly-increasing ratio grow the difficulties and expense of obtaining an adequate and uncontaminated supply. The water-draining from highly-cultivated lands, and the streams which drain populous regions generally, are not in condition to constitute sources of supply for ordinary domestic purposes, and thus, with extending population, public authorities are obliged to go to increasingly great distances, and to incur augmented expense in obtaining a proper W.-S. The difficulties of W.-S. as a national question have begun to make themselves so felt in the United Kingdom that H.R.H. the Prince of Wales invited the Government (March 1879) to appoint a Royal Commission to investigate the question in its national bearings, and doubtless active steps will soon be taken in connection with the subject.

All fresh W.-S. is primarily obtained from rain. The rain which falls on any surface partly disappears by evaporation, is partly absorbed and transpired by the organic life of the region, and partly penetrates into the interior of the earth and reappears as springs, while the remainder as surface water collects into streams and rivers and passes out to the ocean or sea by the main waterway of the area. Only the springs and surface water of any region are available as sources of W.-S., and the various conditions under which the water from these sources is collected

may be embraced under—1, Wells, deep and shallow; 2, springs; 3, lakes or natural reservoirs; and, 4, streams and rivers. Shallow wells, which may be formed in any pervious superficial deposit overlying clay beds or other impermeable strata, are the commonest sources of private supply. Being always sunk in immediate proximity to human dwellings, and being made in highly pervious sand, gravel, or light soil, they are in great danger of becoming receptacles of much imperfectly filtered sewage water. Deep wells again may collect their stores not only from the immediately surrounding surface, but also from a considerable distance. When the waters of such deep wells rise higher than the surface on being tapped, and when consequently no pumping is required, the wells are known as Artesian Wells (q. v.). The depth to which such waters penetrate and the extent of ground they permeate secure their perfect filtration and a most desirable steadiness of temperature and condition. The geological deposits which appear to be most favourable for the percolation and retention of water are the Triassic, Oolite, and Chalk formations, and to a smaller extent the Lower Tertiary beds. The outcrop of the Chalk around London absorbs an enormous quantity of water, which is perfectly filtered by passing through a great mass of porous rocks, and is reached and utilised in London by means of deep wells. Paris, situated on a similar geological basin, is also supplied with a large quantity of water for public purposes from deep Artesian wells. In Liverpool and Birkenhead about 14 millions of gallons are obtained daily from public pumps sunk in the Triassic rocks of that district. Among the numerous plans proposed for increasing the W.-S. of London, one suggestion is to sink deep Artesian wells into or through the Chalk around the city, and to pump the yield from these to artificial reservoirs situated on Hampstead or other high-lying localities. Springs are simply deep wells, the waters of which rise to the surface through natural fissures instead of by channels artificially formed. A large proportion of the W.-S. of Edinburgh is derived from springs situated on the flanks of the Pentland Hills, the waters of which are collected into a series of detached reservoirs formed among the hills. Streams and rivers form the obvious and natural sources of supply of the population of their drainage, area, or catchment basin, and the principle that these alone by right belong to the population within their area has been laid down by the Water Commission of 1869. It is only in their upper reaches, however, that streams are, as a rule, available for domestic supply, as the waters passing through cultivated lands, and populous, especially manufacturing, districts, are so contaminated that they cannot be used for ordinary supply. Rivers further are subject to periodical floods, during which the water is heavily laden with both organic and inorganic impurities, and consequently unfit for use. Again, in periods of drought the supply may fall short, and to guard against both these evils, and maintain a constant supply of equal quality, artificial store-reservoirs on a large scale are absolutely necessary. *Lakes*, on the other hand, are such store-reservoirs prepared by nature, and when they are within the reach of any considerable population they form the best and most economical sources of supply. In the United Kingdom they are only found on a great scale in hilly regions where natural lake-basins have been scooped out by glacial action, and where also the annual rainfall is high. As they generally drain tracts of hilly country composed of primitive rocks where the population is sparse, they are reservoirs of exceedingly soft pure water, and such sources are now eagerly desired by all great cities. In respect of lake-supply no town is more favourably situated than Glasgow, which draws its water from Loch Katrine, a distance of 26 miles. Dundee likewise possesses a pure-lake supply; Manchester persistently seeks to draw its water from the distant Thirlmere in Cumberland; and gigantic schemes have been propounded to carry water to London from the same lake region, or from Bala Lake in N. Wales.

In providing a W.-S. for any community, the first question which should engage the attention of authorities is the purity and quality of the water; next, the sufficiency of the supply; and thirdly, the expenditure involved in making the supply available. The late Dr. Parks (*Practical Hygiene*) divides waters into four classes, 1st, pure and wholesome; 2d, usable; 3d, suspicious; and 4th, impure. The characters of pure water he thus defines: 'It should be transparent, without suspended matters, smell, or taste, and be well aerated. The total solids should not exceed 8 grains per gallon, of which only one should be dissipated by heat, unless it be a chalk water, in which case the total solids should not exceed 14 grains per gallon of calcium carbonate, and should contain only traces of calcium sulphate. The matter destructible by heat (allowance being made for the decomposition of calcium carbonate) should be under 1 grain, and should scarcely blacken; the indications of nitrites should be absent; of nitrates and ammonia extremely slight.' The characters of the 4th class he thus states: 'Any water so turbid as not to be purified by coarse filtration, or with a decided smell or taste, or containing very large quantities of mineral substance (over 50 grains per gallon), and over 4 grains per gallon of destructible (presumed) organic matter, if at the same time the indications of nitrites, nitrates, and ammonia are large, is impure. If on evaporation to dryness and careful incineration there is not only great blackening, but a decided indication of nitric acid fumes, or a smell of burnt horn, or if a large amount of potassium permanganate is rapidly decolorised, the water is impure.' Waters of a quality intermediate between these two should only be used for drinking after filtration, and the kind indicated under class 4th should not be employed under any circumstances as a source of ordinary supply. When there is no alternative but to use such impure water, much may be done to remove its noxious qualities by filtration and other purifying agencies.

Among various tests of the purity of water, the following of easy application may be enumerated. 1st, *Evaporation.* Boil down a measured quantity of water to dryness, and completely dry the ashy residue by heat. If the ash remaining is white and powdery, it is a good sign; but if it contains yellowish and greenish stains, and if, on heating to redness, it partly burns away with an offensive smell of burning animal matter, it may be concluded that the water is tainted with offensive and dangerous sewage matter. 2d. The permanganate of potash test yields valuable indications of organic contamination. The application of this test is thus given by Professor Church: 'Fill a clean white tea-cup with the water to be tested. Add about 60 drops or a drachm of weak sulphuric acid; stir with a clean slip of window glass, now pour in enough of a weak solution of permanganate of potash (Condy's Fluid) to render the water a rich rose colour. Cover the cup with a clean glass plate. Now, if there be much organic matter in the water, the colour will go in a few minutes, and more permanganate may be added and still lose its colour. It must be recollected in using this test that peaty matters and iron salts, which are not necessarily unwholesome, give the same result.' The presence of common salt, which, except in situations near the sea, or in salt-yielding regions, when it exceeds about a grain per gallon, is an indication of dangerous organic impurity, and may readily be detected by a turbidity it creates when a small quantity of a solution of nitrate of silver (lunar caustic) is added to the suspected water. The hardness of water is due to the presence of inorganic compounds held in solution, of which the principal are the carbonate, sulphate, and chloride of lime and the corresponding salts of magnesium. That portion of such salts which can be precipitated by boiling the water causes what is known as the temporary hardness, and consists chiefly of the carbonate of lime. The permanent hardness is due to the sulphate and chloride of calcium and the magnesian salts, which are not affected by boiling. Hardness is not necessarily a property deleterious to potable water, but such water is very objectionable for washing clothes, for baths, and like domestic uses. It favours also the deposit of earthy and lime compounds on boilers. The amount of hardness in any water may be tested by Clark's soap test, based on the circumstance, which can scarcely fail to be observed by all, that in using soap in hard water a proportion of the soap is always lost in the form of a hard, insoluble curd before any lather will form. The quantity of soap thus wasted by some hard waters is very great, and it thus becomes a matter of much economic importance. One thousand gallons of the Kent Company's water supplied in London from chalk wells destroy 26·5 lbs. of soap, while the Loch Katrine water in Glasgow destroys less than half a pound. The temporary hardness of a water may be effectually removed by a process invented by the late Dr. Clark of Aberdeen, and now used on a large scale in many localities. It consists in adding to the water to be softened a certain proportion—determined by experiment—of quicklime. The lime so added combines with the carbonic acid which holds the carbonates of lime and magnesia in solution, and thereby both

added lime and these original elements of hardness are carried down. *Filtration* is a process carried out both on a public and private scale with the greater part of the water supplied for domestic use. Filter-beds of sand and gravel are used on a large scale, and in domestic filters the substances principally employed are charcoal and spongy iron. (See FILTRATION.) When water is at once excessively soft and impure, it acts on the lead of cisterns in which it is stored, and the lead pipes through which it passes, with dangerous rapidity, and may produce symptoms of lead-poisoning. The water which is supplied to Glasgow, however, although among the softest in use, has not been found to be objectionable on account of its action on lead.

The quantity of water actually consumed in different towns varies within wide limits. The configuration of the town affects the demand somewhat, but the principal cause of variation is the prevalence or absence of water-closets, and the nature of the supply, whether constant at high pressure or intermittent. Glasgow, which enjoys a constant high pressure, and is almost entirely a closeted town, consumes at the rate of nearly 50 gallons per head daily, but by watchful supervision that excessive amount is being gradually much reduced. In many English towns from 20 to 25 gallons per head is found sufficient for all purposes, and in London itself the average supply is not greater. With an intermittent service, domestic store-cisterns become a necessity, and in many positions they are most objectionable, as they absorb noxious vapours, and not rarely they are in direct communication with sewers, and become tainted with gases, and even more palpable filth. The insufficiency of pressure in the case of fires is also a serious objection to the intermittent system. Under a constant high-pressure supply the water to be used is always drawn direct from the street mains, and the only objections to the system are wastefulness, which may be curbed, and the utter collapse of supply when anything goes wrong with the main pipes. Regarding the waste of water, Mr. P. Hawksley, C.E, speaking before the Social Science Association at Liverpool in 1876, makes this remark :—'A well-conditioned service requires less than half the quantity of water that is demanded by an ill-conditioned service. Now the collection of water usually costs £60,000 per million gallons of daily supply, and its conveyance to the point at which its distribution commences will frequently cost as much more, but by way of illustration we will say for the two about £100,000. Assuming then that the careless system requires 40 gallons, when the careful system requires only 20 gallons, we have the following pecuniary results: (1) that the careless system will require an expenditure of £4 per head for collection and conveyance ; (2) that the careful system will require an expenditure of only £2 per head. If we apply these results to a population of 500,000 people, we find that the careless system necessitates an expenditure of £2,000,000 for purposes which can be better and more beneficially accomplished on the careful system by an expenditure of £1,000,000.'

As regards the expense of providing a W.-S., we quote the following statement from the address of Mr. Hawksley, already alluded to :—'To provide a town with water of a suitable quality is now a matter of great difficulty and much expense. Competent and available sources are becoming fewer and fewer, and must in general be sought at distances always becoming more remote. Moreover, the value of land, labour, and materials is almost day by day advancing, and so rapidly and steadily that the present cost of a reservoir is, as I know by repeated experiences, double what it was less than thirty years ago. Indeed, the present average expense of procuring and distributing a gravitation supply of 1,000,000 gallons per day, obtained from a distance of only 10 miles, is rarely less than £160,000, and not very unfrequently even a larger sum. Taking into account the interest on the capital invested, the redemption money, the repairs and maintenance, the rates and taxes, the working expenses, and the incidental disbursements, the cost of 1,000,000 gallons a day, thus obtained, commonly enough amounts to £12,000 a year, and hence the cost of 1000 gallons of water now amounts to nearly 9d. net, whereas in my own bygone days, 4d. or 5d. per 1000 gallons was considered a rather extravagant charge.' This being the experience of one of the most eminent of our modern hydraulic engineers, is sufficient to show that the question of the W.-S. of our great cities may soon become one of the most perplexing and difficult with which municipal authorities have to deal.

Wat'er-Table, in architecture, a projecting stone sloped on the roof to throw off water. It occurs in buttresses and other parts of Gothic architecture.

Wat'ertown, a town of New York, U.S., on the Black River, 3 miles above its debouchement into Lake Ontario, and the junction of several lines of railway. It is supplied with water-power from the Black River, which is here 60 yards wide with a fall of 24 feet. W. has a U.S. arsenal, court-house, several churches, and extensive manufactories of woollen goods, paper, flour, machinery, &c. Pop. (1870) 9336.

Wat'ertown, a town of Wisconsin, U.S., at the junction of the Chicago and N.W. railway, about 40 miles W. of Milwawkee. It contains two seminaries, one Protestant and one Roman Catholic. A large proportion of the inhabitants are German. Pop. (1870) 5364.

Wat'erville, a small town of Maine, U.S., on the Maine Central railway and Kennebec river, 18 miles N.W. of Augusta. It has several churches, a college, cotton-mills, and door, sash, and blind factories. Pop. (1870) 4852.

Wat'er Vi'olet. See HOTTONIA.

Wat'ery Gripes is a popular designation for a form of serous diarrhœa, occurring in infants, the discharges being copious, thin, watery, often nearly colourless, and occasionally intermixed with flakes or shreds. Owing to the severity of the symptoms, and the rapidity of action, the disease is sometimes called *cholera infantium*, and there is some reason for the designation, as the malady is very dangerous, and often rapidly fatal. W. G. may be caused by sudden impressions of cold on the surface, or by cold drinks taken when the body is heated, and also by exposure to air contaminated with the products of decomposition. The first thing to do in a case of infantile diarrhœa is to produce evacuation of the bowels by means of a small dose of castor-oil with a few drops of tincture of opium, and the child should be wrapped up in warm flannel, and hot flannel cloths should be kept constantly applied over the abdomen. A few grains of Dover's powder, or aromatic powder of chalk and opium, according to the age of the child, may be given. Extract of hæmatoxylon is probably the best astringent that can be given, and tincture of red gum is also serviceable.

Wat'ford, a market-town of Hertfordshire, England, on the Colne, 17½ miles N.W. of London by rail, has two churches, St. Mary's (restored 1848–71, at a cost of £11,000), with a spire 100 feet high, and St. Andrew's (1858), in Early English style. Other buildings are the Public Library and School of Science and Art (1874), Masonic Hall (1873), the London Orphan Asylum (for 350 boys and 200 girls), the almshouses of the Salters' Company (1864) and of the late Countess of Essex (1876), eight schools, &c. A silk factory, iron-foundry, and three breweries, form with malt-kilns and corn-mills the chief industrial establishments of W., which publishes one weekly newspaper, and had a pop. (1871) of 7481.

Wat'kin, Sir Edward William, the son of a merchant, was born in Manchester, 1815, became a partner with his father, and entered on a career of public usefulness. He was an advocate of free-trade from the beginning of the Anti-Corn-Law movement to its triumph in 1846, organised the great literary soirees of the Manchester Athenæum presided over by Dickens, Disraeli, and Talfourd in 1843–45, was mainly instrumental in opening the 'Queen's,' 'Peel,' and 'Philip's' parks, was one of the originators of the *Manchester Examiner*, and took an active part in bringing about the confederation of the Canadian Dominion and the adoption of the Intercolonial Railway scheme. He was made a baronet in 1868. A prominent representative of the railway interest both in England and in Canada, and a pronounced Liberal in politics, he sat for Stockport 1864–68, and was returned for Hythe and Folkstone in 1874.

Wat'ling Island. See BAHAMAS.

Wat'son, Richard, an English prelate, born at Heversham, Westmoreland, in August 1737, from the grammar-school of his birthplace was elected to a sizarship of Trinity College, Cambridge (1754), where he became a fellow (1760). Knowing nothing of science, he was raised to the chemical chair (1764), but exchanged it in seven years' time for that of divinity, and the latter he retained as well as a prebend and the archdeaconry of Ely, when in 1782 he was advanced to the bishopric of Llandaff. Himself of doubt-

ful orthodoxy, he combated the views of Gibbon and Paine in his *Apology for Christianity* (1771) and *Apology for the Bible* (1796), other works by him being *Chemical Essays* (5 vols. 1781-87; 7th ed. 1800), *Sermons on Public Occasions* (1788), and *Miscellaneous Tracts* (2 vols. 1815). He died at Calgarth Park, in Westmoreland, 4th July 1816. See his autobiographical *Anecdotes of the Life of R. W.* (Lond 1817).

Watt, James, was born at Greenock, Scotland, January 19, 1736. He early displayed a strong love for mathematical and especially mechanical science, and at the age of eighteen was apprenticed to a mathematical instrument maker in London. After a year's stay there, however, he was obliged on account of bad health to return home. In 1757 he started business in Glasgow as a mathematical instrument maker; but, though patronised by the university and occupying premises within its precincts, he was just able to make ends meet. In 1763 he set up as a general engineer, and soon acquired a high reputation. In 1767 he was employed as surveyor and general valuator for the projected Forth and Clyde canal, and from this time his fame as an engineer steadily grew. W. improved the harbours of Ayr, Port-Glasgow, and Greenock, formed plans for the deepening of various rivers, and projected the Caledonian Canal. For his survey work he introduced many improvements in the construction of instruments; but these, though fully evincing his singular inventive genius, sink into insignificance beside the great additions which he made to our knowledge of steam and its properties as a motive power. The years during which he wrought as instrument maker to the university he had profitably employed in self-culture, and as early as 1759, at the suggestion of Robison, afterwards Professor of Natural Philosophy in Edinburgh University, his attention had been directed to steam as an effectual working power. In 1764, while repairing a working model of Newcomen's engine which belonged to the university, he saw at once in what directions improvements were necessary so as to prevent the great waste of energy which was inevitable. He determined to remedy this great defect, and effected his object in 1765 by the invention of the separate condenser (see STEAM-ENGINE). The utilisation of the expansive force of steam to effect both the down and up stroke of the piston completed his great improvements, though the subsequent inventions of the eccentric crank and parallel motion would of themselves entitle him to a first place among inventors. His first arrangements with Roebuck of the Carron Iron Works for the construction of steam-engines were put an end to by the failure of the latter, but in 1773 he entered into partnership with Boulton of Soho, Birmingham. He had taken out his patent in 1769, and in 1775, when the firm of Boulton & Watt began to construct engines, he got his patent prolonged for twenty-five years. He retired from business in 1800, and died at Heathfield, Staffordshire, August 25, 1819. W. was a fellow of the Royal Societies of London and Edinburgh, and a foreign member of the Institute of France. Though known best as inventor and engineer, in the more theoretical departments of science he was quite at home, and was an independent discoverer of the composition of water, though Cavendish had the priority (see WATER). See Muirhead's *Mechanical Inventions of J. W.* (2d ed. 3 vols. 1859), and Smiles' *Lives of Boulton and W.* (Lond. 1865).

Watteau, Antoine, the celebrated French 'pastoral' painter, was born at Valenciennes in October 1684, and after studying art in his native town removed in 1704 to Paris, where his work as a decorative painter attracted the notice of Gillot. Apt and indefatigable, he greatly improved by study of the works at the Luxembourg, especially those of Rubens, and outvieing Gillot in popularity, he was made a member of the Academy in 1717, and subsequently *Peintre de Fêtes Galantes* to Louis XIV. His subjects were such as may be implied from the later title—rural groups, *fêtes champêtres*, idylls in court dress, serenading scenes, and all that has gone to make his name a synonym for the pseudo-pastoral, and has gained for spurious romance in landscape the designation of *à la W.* Representing fairly the general spirit of the age, in which they then obtained a high reputation for the artist, his works are characterised by freedom and fluency, neatness and spirit, a piquant jauntiness of motive, and a pleasing tone of colour. They are numerous and widely scattered; the finest collection is at the Louvre. On account of ill-health W. visited England in 1720, and after remaining there for two years returned to Paris and died at Nogent, 21st July 1721. He had many imitators, but even Greuze, the most successful, fell far short of the brilliant espiégelrie of the master. A good idea of W.'s art may be gained from *Figures de Différents Caractères de Paysages et d'Études Dessinées d'Après Nature par A. W.* (2 vols. with 350 plates, Par.); *The Ornamental Designs of W.* (10 vols. of lithographed plates, Lond. 1840 *et seq.*); Goncourt's *Catalogue Raisonné de l'Œuvres de W.* (Par. 1876); and *Twenty-six Drawings by W., reproduced from the Original Works* (Arundel Society (1878).

Wattle, an Australian colonial name for a species of Acacia (q. v.).

Wattle-Bird (*Anthrochæra carunculata*), a species of Australian *Meliphagidæ* or honey-eaters, attaining the size of a magpie, and coloured of a greyish-brown hue. It possesses a curious appendage of reddish colour depending from each side of the throat, and from this structure the bird derives its popular cognomen. The food consists of honey and flower-juices.

Wattled and Combed. See BARBED.

Watts, Isaac, D.D., was born at Southampton, 17th July 1674. He studied at a Nonconformist academy at Newington, London, was then appointed (1698) assistant clergyman to the congregation worshipping in Mark Lane, some years after (1702) sole pastor of the same body. Obliged through bodily weakness to resign his charge (1712), he spent the rest of his life at the family seat of Sir Thomas Abney, Abney Park, near London. He died 25th November 1748. W. wrote *Hymns and Spiritual Songs* (1707), *Divine and Moral Songs for the Use of Children* (1720), *A Manual of Logic* (1725), several volumes of *Sermons*, besides other works of less note. As a religious poet W. has been always widely popular. His hymns are marked by religious fervour and evangelical zeal. Widely separated parties have used them as manuals of Christian devotion, and they have come home to the heart of the English common people in a way that no other devotional lyrics, not even Wesley's or Cowper's, have done. The *Logic* of W. was for long a widely popular book. Though not distinguished by profound metaphysical thought, it is yet a very able treatise. It is plain and practical, vigorous and sensible, and may even yet be read with profit. The works of W. were published in a collected form first in six then in nine vols. (Lond. 1810–12). See the Biographies of Milner, Southey, Palmer, Gibbons, and Hood (Lond. 1875).

Waugh, Edwin, was born at Rochdale, 29th January 1817, and worked in a bookseller's shop until the age of thirty. He was then appointed secretary to the Lancashire Public School Association, with which he was connected for nearly five years. His first productions of any note were published in the *Manchester Examiner* in 1846-47. His first song, 'Come whoam to thy childer and me,' appeared in that paper in 1855, and became as popular in the N. of England as some of Burns' songs in the W. of Scotland. Other works of W.'s are *Lancashire Sketches*, *Poems and Lancashire Songs*, *Factory Folk during the Cotton Famine*, *Rambles in the Lake Country*, *Tufts of Heather*, *Besom Ben*, *The Old Blanket*, *Jannock, or the Bold Trencherman*, *Old Cronies*, *The Barrel Organ*, *Rambles and Reveries*, *The Chimney Corner*, *Up the Rhine*, &c. W. is a genuine and original poet and humorist; and his best productions will always be read with delight, particularly in Lancashire.

Wauke'gan, a city of Illinois, U.S., on a bluff overlooking Lake Michigan, 35 miles N. of Chicago by rail. It has 9 churches, 2 weekly newspapers, carriage factories, machine-shops, tanneries, &c., but is chiefly important as a pleasure resort. It has valuable mineral springs. Many Chicago merchants reside here. Pop. (1876) 6000.

Waves. In its most general sense, a wave consists of the propagation of a particular configuration or state of strain through a system of particles or other material medium. Thus, if we observe what goes on in a substance at a given place and immediately transport ourselves forward in the direction of propagation of the wave, then after a definite interval of time we shall observe the same things occurring in the same order at the new place. The sequence of changes which was observed in both cases was caused by the passage of the wave, which similarly affected all places intermediate to the places at which the observations were made. Since a wave, then, consists of the propagation of a state of strain, there must have been stress applied originally to pro-

duce the strain, while the strain itself travels because of the elasticity of the medium. The portion strained by the direct application of the stress recovers itself and passes on the strain to the contiguous portion, which also recovers by reason of its elasticity, and acts similarly upon the next portion. Consider, for instance, the propagation of ripples over the surface of a still sheet of water when a stone or other body is dropped into it. The liquid immediately beneath the stone is forced down, and, as water is practically incompressible, this necessitates the rising of liquid all round the stone. This raised ring of liquid, however, at once descends by its own weight, simultaneously pushing up the next cylindric column which borders on it; and in this way a growing circular wave is propagated from the point of original disturbance as centre over the surface of the water. If the attention is fixed upon any one point of the surface, this point will be observed to rise and fall with an approximately simple harmonic motion as the wave travels past it. This oscillatory or vibratory motion is a characteristic of all the simpler cases of wave-motion with which we are acquainted; and even in more complex cases a certain periodicity in the motion of each elementary portion of the substance is observable as wave after wave of the same type passes through it. The distance from crest to crest of such successive W., or more generally the distance between any two successive elements which are passing through the same phase of their periodic motion, is called the *length* of the wave; and this length divided by the periodic time of the wave. *i.e.*, the time during which any element passes through its periodic changes, is called the velocity of the wave. For example, the velocity with which a wave travels along a stretched inextensible string of length l, mass m, and tension T, is given by the formula $\sqrt{\frac{Tl}{m}}$. A neat and elementary though indirect proof of this is given in Thomson and Tait's *Elements of Natural Philosophy*, vol. i.

A very important class of W. is that which includes W. of compression and dilatation, which are familiar in the atmospheric W. which constitute sound. Suppose, for definiteness, a tuning-fork to be sounding at the mouth of a long tube filled with air or other gas. Then with every vibration of the prong, a *crest* of condensation followed by a *trough* of rarefaction is sent along the air in the tube. If there is no loss of energy throughout the operation, every particle of air, however distant, will be set into to-and-fro vibrations of exactly the same period as the vibrations of the tuning-fork. It is evident, however, that the phase of each particle at any given instant will depend upon its distance from the end of the tube. Thus, as a wave passes along the tube each particle of air vibrates to-and-fro through, in general, a very small space about its mean position. A particle a little further on performs the same motion precisely, except that it passes through its mean position a little later; and hence, according to the relations of phase at any instant, the two contiguous particles will be either approaching or receding from each other. If we then consider any narrow segment of air bounded by two contiguous normal sections, this elementary volume will be subject to a periodical compression and dilatation accompanied by a simultaneous to-and-fro vibratory motion of the same period. If we assume that Hooke's Law of Elasticity holds for sudden compression of air, the velocity of a sound-wave is found to be $\sqrt{\frac{p}{\rho}}$ where p is the pressure and the ρ density of the air. This value when calculated is found not to agree with experiment, but when allowance is made for the thermal relations of gases, as was first done by Laplace, the reason of the discrepancy is made apparent (see SOUND).

Take now the case of W. in liquids. Of these there are several species. There are W. of compression, such as sound W. in water, which are similar in character to atmospheric sound W., but which travel much faster. Then there is the *long* or *solitary* wave, whose length is great compared to the depth of water. Such are the tidal wave, and the long wave which accompanies a canal-boat. Its main characteristic is that the horizontal disturbance is the same at all depths, while the difference of pressure on the ends of any small horizontal element is due to the difference of level at the surface. The velocity of the wave depends only on the depth, being equal theoretically to the velocity which a stone would acquire in falling through a height equal to half the depth of the water. The case of *oscillatory* W. falls next to be considered, and amongst these are included all W. whose lengths are small compared to the depth of the liquid, from the long mid-ocean roller to the smallest ripple on a pool. If the depth is infinite compared to the wave-length, each particle of liquid describes a *circle* about its mean position, a circle whose radius diminishes rapidly as the depth increases. Thus at a depth equal to a wave-length the disturbance is on $\frac{1}{535}$th of that at the surface. Consequently storm W. agitate the ocean to a comparatively small depth. The velocity of such W. to a first approximation is given by the formula $\sqrt{\frac{gl}{2\pi}}$, where g is the acceleration due to gravity, l the length of the wave, and π the ratio of the circumference of a circle to the diameter, so that the wave moves slower the shorter it becomes. If, however, the wave is very small, surface tension must be taken into account, and then as the wave diminishes the velocity increases, becoming infinite when the length vanishes. Here we have the distinction between an ordinary wave, which runs mainly by gravity, and a ripple, which runs mainly by surface tension—the longer the wave the faster it runs; the ripple runs faster the shorter it is. Hence there must be a wave intermediate in character to these two types, the velocity of which is a minimum. As sea W. approach a shelving beach they alter their character and act more as long waves, whose velocity, as we saw above, diminishes with the depth. Hence such a wave coming in from the sea is travelling faster than its circumstances admit of. Consequently there is resistance offered to its progress, the base is retarded, while the crest, advancing by its own momentum, curls over in the manner characteristic of all *breakers*. The propagation of W. through elastic solids is the last case which calls for mention. This, however, is a subject of much higher difficulty than the preceding, and no general solution has yet been given. Its physical importance arises from the fact that the transmission of light through the ether seems to belong to this class of problems. Neumann, Maccullagh, Stokes, and others have discussed it in various aspects, but our present analytical methods are not sufficient for its solution. See UNDULATORY THEORY.

Wavre, a town of Belgium, province of Brabant, on the Dyle, 15 miles N.W. of Louvain by rail. It carries on brewing, dyeing, and the manufacture of cottons and paper. Pop. (1874) 6553. Near W. the Prussians under Thielemann defeated (June 18, 1815) the French under Grouchy, who was thus hindered from coming to the aid of Napoleon at Waterloo.—**W.** or **Wawer**, a village of Russian Poland, government of Warsaw, on the Vistula, 9 miles N. of Warsaw, the scene of bloody battles between the Poles and the Russians under Chlopicki on the 19–20th February 1831, and again on the 31st March, the latter resulting in favour of the Poles.

Wax, a name given to various animal and vegetable substances having analogous physical peculiarities, but differing somewhat in chemical constitution and in other properties. They are all hydrocarbon compounds allied to oils and fats, but common W. differs from the ordinary fats in containing no glycerine. In addition to bees' W., which is the variety commonly indicated when the term is used, the following substances are known under the name of W.:—*Chinese W.*, or *Pela*, a body obtained by the puncture of the branches of certain trees by an insect, *Coccus pela*, allied to the insect which similarly produces cochineal. Pela is a hard, glistening, white, semi-crystalline solid, resembling spermaceti, and fuses at 179·6° F. It is composed principally of cerotin, the principal constituent of bees' W. *Japanese W.* is a hard, whitish, fatty substance, said to be obtained from the *Rhus succedanea*. It melts at 107·6° F. *Carnahuba W.* is a product from the leaves of the palm, *Corypha cerifera*, growing in Brazil. It is of a greenish-white colour, excessively hard, and fuses only at 182·3° F. *Palm W.* is a closely-allied product obtained from the palm, *Ceroxylon andicola*, of S. America. Its fusing-point is about the same as that of Carnahuba W. *Myrtle W.* is obtained from the berries of *Myrica cerifera*, and other species growing principally in the United States, but also in Cape Colony. It forms a greenish-coloured, hard, solid substance.

Common W., which forms the honeycomb of the various species of bees, is in its unbleached condition a hard unctuous solid, possessing usually a faint sweetish odour, but no taste. It is easily separated from the extraneous matter of the comb by melting in water, when the W. floats on the surface of the water as a thin, oily fluid, which is drawn off and allowed to solidify into

cakes. A large amount of unbleached W. from almost all regions is annually imported into the United Kingdom. The preparation of purified or White W. (*Cera alba*) is accomplished by exposing the substance in very thin flakes or shreds to the influence of the atmosphere and light, the W. being periodically watered and turned, as is done in the case of grass-bleaching of linen, &c. When the whole of the surface colour has disappeared the W. is re-melted, and a new surface is thereby obtained for exposure, and the treatment is thus continued till a uniform white colour is obtained throughout the mass. W. may also be bleached by the use of bleaching powder and other chemical agents, but the process is objectionable, because it not only injures the material, but in the case of bleaching powder the whole of the chlorine is not removed; and when the W. so treated is used for burning, irritating and deleterious fumes of hydrochloric acid are given off. Pure white W. consists to the extent of nearly 80 per cent. of cerotin, soluble in boiling alcohol, with nearly 20 per cent. of an insoluble waxy substance called myricin, and a small proportion of cerolein, which gives hardness to the mass. It is semitransparent, tasteless, and inodorous, softening so as to admit of being moulded by the fingers at 85° F., and melting at 145° F. It is chiefly used for making candles of unequalled beauty and illuminating effect, for modelling and making wax flowers and fruits. *Medicinally*, White W. has emollient properties, and is chiefly employed in medicine as an ingredient in ointments and in the preparation of simple ointment. Yellow W. is also used as an ingredient of plasters and ointments. Owing to its high price, white W. is much adulterated with spermaceti and inferior waxes, and even with starch, &c.

Wax, Min'eral, a popular name for certain fossil hydro-carbons, which occur in small quantities chiefly in the Carboniferous formation. The most familiarly known variety of M. W., viz. ozokerit, has been used for the manufacture of candles, which are of a shining black colour, unless purified by a complicated process. Preparations of a similar nature are now employed, especially in America, as a basis for medicinal ointments, and are sold under the names of ozokerine, vaseline, &c. They possess a great advantage for this purpose over lard, from their non-liability to turn rancid.

Wax-Cloth, a popular name for oil-cloth or Floor-Cloth (q.v.).

Wax Flowers. The manufacture of W. F. and fruit is peculiarly a British industry. Thin sheets of bleached or coloured bees' wax are used for leaves and petals, and wire covered with cloth for stems. The leaves are curled by means of metal or ivory 'pins,' and variegated tints are brought up with dry colours. W. F. are more easily made than flowers of cambric, &c. (see FLOWERS, ARTIFICIAL). Fruit is modelled hollow by means of moulds of plaster-of-Paris or other composition. A very pure kind of paraffin has of late years been successfully substituted for bees' wax in modelling. Owing to their fragility W. F. are chiefly employed as table ornaments. and not for toilet purposes.

Wax Insect, the name given to various insects that secrete wax. In the Bee (q. v.) the wax-secreting glands appear to consist of special modifications of dermal or skin glands. The Hemipterous family *Coccidæ* includes the chief wax insects, familiarly known as bark lice. They inhabit the bark of trees and shrubs, one species, *Coccus cacti* of Mexico, being the species which affords *Cochineal* (q. v.). *Coccus sinensis* is a W. I. inhabiting a kind of sumach-tree (*Rhus succedaneum*), the wax secretion being gathered from the branches on which it is deposited.

Wax Myr'tle. See CANDLEBERRY.

Wax Paint'ing, another name for Encaustic Painting (q. v.).

Wax Palm of New Granada is *Ceroxylon andicola*, a tall elegant palm with a whitish stem attaining 190 feet, and surmounted by a tuft of pinnate leaves, each 20 feet long. It is remarkable amongst *Palmæ* from the altitude at which it grows. Humboldt first discovered it at the foot of the snow-clad volcano of Tolima in the central Cordillera, and it grows in abundance at an elevation between 6500 and 9700 feet in N. lat. 4° 35'. The trunk is annulate, covered all over with a thin coating of a whitish substance, which is scraped off, mixed with tallow, and made into candles. It consists of vegetable wax, and a crystalline resin called *Ceroxylin*. For the W. P. of Brazil see CARNAHABA, and consult article PALMS.

Wax Sculp'ture was known to the Greeks and Romans, and was much practised by the Italian artists of the Renaissance. Portrait medallions in wax placed on a ground of coloured ivory or other material were fashionable in Italy and Germany during the 16th and 17th centuries. The 'waste wax' (*cire perdu*) process of casting bronze, which is still in use, is very ancient. A core of baked clay and other substances presenting the general contour of the object to be produced is covered with a layer of wax, which is worked by the sculptor into all the details of a finished work. Rods of wax are then placed where required for air-ducts, and the whole surface is carefully covered with fine liquid plaster on which a thick coam is afterwards laid. The work is then exposed to heat, to run out the wax from between the core and external mould. This having been effected and the surfaces dried, molten bronze is run into the vacant space, and a facsimile in metal of the sculptured wax thereby obtained. The process is hazardous, for should the casting be faulty the artist's long labour is lost.

Wax Tree (*Vismia*), a genus of *Hypericaceæ*, in which some of the tropical American species yield a copious supply of the yellow resinous juice characteristic of the order. This gum-resin so much resembles gamboge in appearance that it is called American gamboge: it possesses like purgative properties.

Wax'wing (*Ampelis garrula*), a species of *Insessorial* birds belonging to the *Dentirostral* group. It is also known as the Bohemian Chatterer. It derives its name from the red wax-like appendages attached to the secondary and tertiary quills of the wing. The bird attains a length of 4 or 5 inches. Its plumage is greyish brown, with darker markings, and the head bears a crest of orange-brown feathers. The W. occurs in England, and migrates southwards in winter. The food consists chiefly of berries and other fruits. The American W., or Cedar Bird, is the *Ampelis cedrorum* of ornithologists. It is crested like its Old-World namesake. Its colour is a reddish olive above, shaded with grey, a yellowish hue prevailing on the under parts.


Waxwing.

Wax'y Degenera'tion. See AMYLOID DEGENERATION.

Way'land the Smith (Old Eng. *Weland*, Old Norse *Völundr*, Old High Ger. *Wiolant*, Mod. Ger. *Wieland*), a mythical Teutonic hero, who in the Edda-lay *Völundar-kvida* appears with his brothers Slagfidr and Egil, sons of the king of the Finns. The brothers went on snow-shoes to hunt, and came to Wolfdale, where they built a house by Wolf Lake. Early one morning they found three fair maidens sitting on the border of the lake and spinning flax, with swan plumages lying beside them. The brothers induced them to go to their dwelling. Egil had Olrun, Slagfidr had Swanwhite, and W. had Allwhite. After they had lived together seven years, the maidens, who were indeed Valkyrjur (q. v.), flew away, seeking battles, and did not return. Egil and Slagfidr went in search of their wives, but W. remained in Wolfdale, busied with smith's work, setting precious stones in gold and making splendid rings to present to his Allwhite when she should return. Nidud, king of the Niars, came to W.'s house, and overpowering him while he slept, carried him off and confined him on Söstadholm, where he was forced to make all manner of jewels for the king. But seizing his opportunity, he killed Nidud's two sons and dishonoured his daughter Bödvild, after which he flew away on a swan's plumage he had contrived. This story may be compared with the numerous tales of swan-maidens in Teutonic mythology, and with the Greek myths of Dædalus and Hephæstus.

The name of W. is still preserved at a place in Berkshire called 'Waylandsmith's Cave,' the popular tradition concerning which Scott made use of in *Kenilworth*. It stands at the foot of the White Horse, and is a megalithic monument, consisting of two chambers constructed of upright stones and roofed with large slabs, called 'Welandes Smidde' in the *Codex Diplom.*, No. 1172. See Grimm, *Deutsche Mythologie*, and *Heldensage*; Scott, *Kenilworth*, chap. xiii. and note; G. B. Depping and F. Michel,

Véland le Forgéron, Dissertation sur une Tradition du Moyen Âge, avec les Textes Islandais, Anglo-Saxon, Anglais, Allemand, et Français-Roman (Par. 1833; Eng. trans., with additions by S. W. Singer, Lond. 1847).

Wayne, Anthony, an American general, was born at East Town, Pennsylvania, January 1, 1745, and became a land-surveyor. He was an intimate friend of Franklin, and took an active interest in public affairs. Having married and settled to farming (1767), he was elected to Pennsylvania convention and legislature in 1774, served on the committee of safety, and in 1775 raised a regiment with which he took part in the campaign against Canada. He fought with distinction and was wounded at the battle of Trois Rivières (January 3, 1776), held the fortress of Ticonderoga and Mount Independence till May 1777, and, after receiving the commission of brigadier-general, led a division at Brandywine (September 11), and commanded the right wing at Germantown (October 4). He made a dashing raid on the British lines in the winter of 1777-78, carrying off a great quantity of supplies, and on the night of 15th July 1779 achieved the most brilliant of the American victories in the storming of Stony Point (q. v.), for which he received a gold medal and the thanks of Congress. By a bayonet-charge he rescued La Fayette in Virginia in 1782, made a daring attack on the whole British army at Green Spring (July 6), and defeated the British and Indians in Georgia. After the war 'mad Anthony' retired quietly to his farm, but he was made major-general in 1792, and again took the field, this time against the Western Indians, whom he overthrew at Maumee Rapids, and forced to conclude the Treaty of Greenville (1795). On his way back to his farm at Waynesborough, he died at Presque Isle (now Erie), 15th December 1796. See Life by General J. Armstrong (Spark's Series). A monument was erected to him at Waynesborough in 1809.

Ways and Means, Committee of. See PARLIAMENT.

Wazi'ris (the children of Wazir or Vizier), a tribe of independent Afghans, who occupy the Suleiman Mountains, on the W. frontier of the Punjaub, British India. It is estimated that they can furnish 44,000 fighting men. Some of them have settled quietly within British territory, chiefly in the district of Bunnu, where they cultivate 27,000 acres and pay a revenue of £900. The majority yet live in the hills, a terror to all their neighbours, especially to the caravans that traverse the Gomul pass. Their crops are wheat, maize, and barley; they rear horses and sheep, and export iron and wood.

Weal'den Forma'tion, a series of freshwater beds which, in the geological scale, intervene between the Upper Oolite and the true Chalk. The W. F. derives its name from the circumstance that it is typically displayed, and was originally investigated, in that part of the south-eastern counties of England known as the 'Weald.' The great interest attached to the W. F. rests on the fact, first pointed out by Dr. Mantell, that, though occupying a position between typically marine strata, it is undoubtedly of fluviatile origin. In it the Belemnites, Ammonites, &c., of the Chalk and Oolite are all wanting, but we find instead the bones of huge reptiles, freshwater shells, plant-remains, and other vestiges of the fauna and flora of the shores of the Cretaceous Sea. Of the Reptilian remains, the most remarkable are perhaps those of the Iguanodon, a gigantic animal first detected by Dr. Mantell in the sandstones of Tilgate Forest. It probably attained a length of 60 or 70 feet, and from its crenated teeth and other characters appears to have been allied to the hideous little iguanas which inhabit the tropical parts of the New World. Among the shells, the genera Paludina, Melania, and Cyrena are conspicuous, and large quantities of a species of the first named of these produce the hard limestone known as 'Sussex marble.' Cypris and other well-known forms (of Entomostraca are very common. Of the Wealden plants, Conifers, Cycads, and Ferns are especially abundant. The W. F. is divided into two groups, an Upper, or Wealden Clay, and a lower, called the Hastings Sand; the united thickness of the two being probably about 2000 feet. The exact area occupied by the W. F. is not very accurately known. Besides the typical locality in the S E. counties, it is exposed in Dorset, in the Isle of Wight, and also appears in France, Westphalia, and Hanover; and the whole of this extensive area is supposed to have been occupied by an enormous river-delta.

Wealth. See CAPITAL.

Wean'ing, and Feed'ing in In'fancy. The separation of the child from the mother necessarily involves a crisis in its existence, and is attended with more or less constitutional disturbance. When the state of health of both mother and child is favourable, it has to be determined what is the proper time for W. As a purely physiological question it must be evident that there is a definite time at which it is proper for the well-being of both mother and child that the latter should enter upon an independent period of existence. It has frequently been asserted that the natural period for W. is on the completion of the process of dentition; but as dentition is not completed till about the close of the second year, the period of suckling is much too long; for the milk secreted ceases long before that time to be sufficient for the nourishment of the child. Indeed, owing to deficiency in the quantity and quality of the milk in relation to the wants of a healthy, vigorous child, the cases are exceptional in which a woman is able to suckle her child, without assistance in the way of extra aliment, for a longer period than ten months; and a large proportion of mothers require supplementary aid much sooner. When the mother, or nurse, is healthy and vigorous, the child should have nothing but what is obtained from the breast for the first six or seven months. A partial failure in the quantity or quality of the milk may occur at a much earlier period, so that it may be necessary even at the second or third month partially to feed while nursing is going on.

No definite time, as to months, can be fixed at which the child should be weaned; but, as a general rule, it should be from the seventh to the twelfth month, and certainly not later than the latter period. In all cases it is advisable to accustom the infant to other food before W.; otherwise the process is much more troublesome. The quantity of milk should be gradually and steadily diminished, and the proportion of other nutriment should be steadily increased until the latter alone remains. If the W. process be thus conducted, a minimum amount of discomfort will follow, and the screaming fits will not last beyond a couple of days. Discomfort may be obviated, in the case of the mother, by saline laxatives, abstinence from fluids, and the application of belladonna, or cooling lotions, to the breasts. The period of W. should be determined to some extent by the state of the child's health, and the process should be delayed until the subsidence of a febrile attack, or of an ordinary catarrh, and during the constitutional disturbance attending dentition. In the case of a perfectly healthy child, and an average result in the eruption of the teeth, the age of about ten months is indicated as the proper period for W., as there is usually a pause in the process of dentition subsequent to the appearance of the eight incisor teeth.

Every mother should be encouraged to nurse her own offspring, unless under exceptional circumstances, such as a deficiency in the quality and quantity of the secretion; abnormal conditions of the nipples rendering suckling difficult; excoriated and chapped nipples; inflammation and suppuration of the mammary gland. In some instances there are constitutional reasons why a mother should never nurse her children, as in cases of phthisis, epilepsy, great constitutional weakness, and nervous excitability. Amongst those in whom there is a hereditary tendency to insanity, an attack of acute mania may be set up by lactation. Whether the infant is brought up at the breast. or by artificially-supplied food, it should be supplied with nourishment at regular intervals, say every four hours, and not when the child begins to cry and becomes restless.

When it is determined that the mother cannot suckle her child, a wet-nurse should be selected, or artificial food must be given, but a wet-nurse is preferable. If a wet nurse cannot be afforded or procured, the infant must be provided with such nourishment as may, chemically and otherwise, most nearly resemble that which nature provides. Asses' or goats' milk may be preferred as nearest in composition to human milk; but the milk of the cow is generally the only kind available. Cows' milk is richer than the human in the corpuscular element, and if given undiluted to a young infant it generally produces some form of gastro-intestinal disorder. If rich and pure, an equal bulk, or even more, of water may be added; but milk supplied in towns being generally previously diluted, not more than a third of added water is necessary. A little ordinary sugar, or, better still, sugar-of-milk, should be added, and the mixture should always be given warm, or about blood-heat.

If at all practicable, it is best to obtain the milk for an infant from one cow. For the first three months milk and milk alone is the best as well as the most natural food for the child; but the safest indications for supplemental diet is in the condition of the child or of the nurse. When a child is brought up on the bottle, it is necessary that the strictest attention should be paid to cleanliness; for if the apparatus is not kept scrupulously clean, small particles of curd are apt to accumulate within it or the tube; and these, if swallowed by the infant, are apt to excite gastric or intestinal disturbance. The best kind of feeding-bottle is that with a valve in connection with the tube, as the tube is thereby always kept full, and less power of suction is required by a weak, delicate child.

Many substances have been recommended as substitutes for or supplementary to milk in the alimentation of infants, and none more highly than Baron Liebig's *Food for Infants*, which was devised as the result of much original research. Nothing is better than rusks of good quality; and, if well made, they require no boiling, but are to be covered for a minute or two with boiling water, which is then poured off, and milk or cream, with a very little sugar, added before it is broken up. When the child grows older, a little chicken soup or beef-tea may be given twice a week; and an approach should be gradually made to the ordinary diet of childhood.

Wea'sel (*Mustela vulgaris*), a species of *Carnivorous* Mammalia, belonging to the *Semi-plantigrade* section of the order, or that in which the sole of the foot is only partially applied to the ground in walking. In each jaw there are eight premolar teeth, and five toes on each foot. The W. is one of the best-known British quadrupeds. It attains a length of from 11 to 12 inches, has a bright brown fur above, but is white beneath. In winter the fur assumes a lighter tint, and instances are on record in which a white colour has occurred in the winter fur. The animal is extremely carnivorous. It attacks rabbits, hares, and birds of all kinds, and is specially fond of eggs. It seizes on the neck of its victim, and appears to wound the large blood-vessels, and thus to drain the body of its blood. The W. readily attacks the dog when brought to bay, and fights with a tenacity astonishing in an animal of its size. The young number from four to five. The W. has its home in some secure situation in a dark or wooded place.

Weath'er is the state of the atmosphere at any time and place as regards its temperature, pressure, humidity, electrification, and motions. Whatever may change any or all of these tends to alter the W., though the changes may not be sufficient to destroy the balance of affairs, so that the W. really undergoes little alteration. The great source of all variations of W. is, then, the sun, taken in conjunction with the earth's diurnal and annual movements. A temperature variation is necessarily accompanied by a pressure variation, and that again generates currents (see WINDS), which, in the endeavour to restore atmospheric equilibrium, bring about the various meteorological changes which are considered under CLOUDS, HAIL, RAIN, SNOW, THUNDER, &c. In temperate latitudes, where these various W. factors are much affected by purely local conditions, it is impossible to predict what the W. will be more than two or three days in advance. From accumulated observations, it is possible to say what the *general* character of the W. will be; such, for instance, as the assertion that the W. will be broken during the equinoxes; but to specify what the state of the atmosphere on a particular day will be is a hopeless task. A careful study of meteorological conditions in the neighbourhood of a given place, such as may be obtained from the daily charts now published by the Meteorological Office, are, however, valuable as indicating if a change of W. is probable, and if so, of what nature it will most likely be, during the next few days. In tropical regions the W. is very constant, undergoing great changes only at special times of the year, if we except occasional storms which sometimes arise. The average annual W. is a good indication of the nature of the Climate (q. v.) at any locality. The necessary instruments for a complete determination of the W. are the thermometer for temperature, the barometer for pressure, the hygrometer for humidity, the electrometer for electrification, and the W.-cock and anemometer for wind measurements. To these should also be added the chemical apparatus for estimating the quantity of ozone, and of the various impurities which ordinarily abound in the atmosphere.

Wea'ver Bird, a name given to certain species of *Insessorial* birds, allied to the conirostral finches. The *Ploceus Taha*, or Taha W. B., is one of the best known. It is of a brownish-yellow colour, variegated with black and grey. The Sociable W. B. (*Philetærus socius*), inhabiting S. Africa, takes its name from its habit of building its nest beneath a common roof. The average length of this species is five inches, and its colour is mainly brown. The Red-necked W. B. (*Hyphantornis textor*) is found in Cingo and Senegal, and has a red collar round the neck. The average length is six inches, and the prevailing colour is orange yellow. The Red-billed W. B. (*Textor erythorhynchus*) occurs in S. Africa, and has a dark-brown plumage, a blackish head, and a crimson bill. It is often seen in Britain as a cage-bird, breeds in confinement, and seems to thrive well. The nests of the Weaver birds exhibit great variation. Some hang from the branches of trees, and are so placed that monkeys and other enemies find access difficult or impossible.

Wea'ving is the art of manufacturing textile fabrics by means of intersecting yarn or thread, previously prepared by spinning. The operation is performed in a loom, the yarn being of two kinds, the warp yarn, which constitutes the web in the loom, and the weft yarn, which crosses the warp, and is arranged on 'spools' or 'pirns' and thrown across the web in a shuttle or shuttles. The art is one of the most ancient and important of all human industries, and it has exercised an influence on the social and material condition of the race not equalled by any other manufacturing art. It is further scarcely too much to say that from its first beginnings till now the art of W. has been progressively improving, that a greater share of the attention of the inventive and ingenious has been devoted to the perfection of W. than has been given to any other industry, and that now as it exists, the loom, with its manifold applications and accessories, is the most marvellous existing trophy of human genius. The essential mechanism and processes for W. a plain piece of cloth are simple; but the variety and complexity of the work which can now be mechanically performed by the loom are beyond all computation and statement. (See LOOM and JACQUARD LOOM.) In the practical operations of plain W., the web or warp is prepared by warping, which consists in laying the number of threads which run lengthwise in the chosen fabric in the same plane, and of equal length throughout. The warp yarn is wound off a number of bobbins equal to the number of threads it contains on a large revolving cylinder or drum, and from this the web of proper length is taken and wound around the beam of the loom, on which the threads are laid parallel, and as nearly as possible of the breadth of the woven cloth. The weft yarn is wound or filled in single threads on weaver's bobbins or pirns, which are placed in the shuttle. In the case of plain-woven fabrics a single shuttle only is needed, but in coloured or otherwise mixed fabrics the number of shuttles must correspond with the different colours and varieties of weft used. The W. of all figured and ornamental fabrics is a most complex and difficult art, and can only be attained by patient study and practice. See A. Barton's *History and Principles of W. by Hand and by Power* (Lond. 1878).

We'ber, Karl Maria Friedrich Ernst von, a German composer, was born at Eutin in the Duchy of Holstein, December 18, 1786. He sprang from a musical race, and his cousin, Konstanze Weber, was the wife of the great Mozart, whose music he loved most dearly. His father was of a restless, roving disposition, soldier, actor, and musician by turns, and his frequent changes of residence deprived W. when a child of a regular musical training. In 1796–97 the boy received lessons from Heuschkel the pianist at Hildburghausen, and afterwards from Michael Haydn at Salzburg. His next teacher, Kalcher at Munich, gave him a solid knowledge of counterpoint. In 1799 he composed an opera, *Die Macht der Liebe und des Weins*, and a large quantity of miscellaneous music. His next opera, *Das stumme Waldmädchen*, produced at Munich in 1800 when he was only thirteen years of age, was also performed in Vienna, Prague, and St. Petersburg. *Peter Schmoll und seine Nachbarn* was brought out at Augsburg in 1803 with indifferent success. After his musical education was completed at Vienna under the Abbé Vogler, he was appointed conductor of the opera at Breslau, where he gained experience in choral and orchestral writing. During the few years which followed he led a wandering but not

idle life, his principal works being a cantata, *Der Erste Ton*, and the operas of *Sylvana* and *Abu Hassan*. From 1813 to 1816 he was actively engaged in Prague as musical director of the opera, the most important of his compositions at this period being a cycle of stirring patriotic songs to Körner's words, *Leier und Schwert*, and a grand cantata *Kampf und Sieg* to commemorate the victory of Waterloo. W. was now a popular idol, and he left Prague to undertake the directorship of the newly-founded German opera at Dresden. In this city he carefully matured his three greatest operas. *Der Freischütz*, produced in Berlin in 1822, was the most brilliant popular and universal success in the history of German opera. It owed this to its original orchestral effects, its mystical character, its weird supernaturalness, and its fresh delicious melodies. Drawing his inspiration from the very essence of the German nature, his work found an echo in every German heart. His musical setting of the drama of *Preciosa* was warmly welcomed at Dresden in the same year. *Euryanthe* was brought out in Vienna in 1823 with indifferent success, but it now holds its place well in popular estimation, notwithstanding its absurd libretto. The favourite opera of its composer, it excels in ideality and imagination. In 1824 W. was commissioned by Mr. Charles Kemble to compose an opera on the subject of 'Oberon,' to a libretto by Planché. Already suffering from pulmonary disease, he came to London in the spring of 1826 for the production of this work, so full of luxurious softness and Eastern splendour. It was his last grand production. He died suddenly in Sir George Smart's house in Great Portland Street, June 5, 1826, and was buried in the Roman Catholic cemetery at Moorfields, whence his remains were transferred in 1844 to Dresden, where a statue (by Reichel) was erected to his memory in 1860. W. was practically the founder of a new school of opera, the Romantic, in which he is the most brilliant master. Beauty of form, harmonic invention, lovely flowing melody, are with him allied to a love of the legendary and the fantastic. He was of a sensitive and poetic temperament, and was original without waywardness or eccentricity. His orchestral colouring was masterly and effective, witness the Wolf's Glen scene in *Der Freischutz*. Among his miscellaneous compositions the Mass in E flat holds a high place. His works for the pianoforte are numerous, and the *Concertstuck*, the *Invitation à la Valse*, and many other delightful efforts, are sufficient of themselves to shed lustre on his name. The Jubilee Overture, together with the overtures to his three great operas, form a splendid group of orchestral masterpieces. See the Autobiography contained in his *Hinterlassene Schriften* (2 vols. 1828), J. Palgrave Simpson's *Karl Maria von W., the Life of an Artist, from the German of his Son* (Lond. 2 vols. 1865), and Jahn's *Karl Maria von W., ein Lebenskizze* (Leip. 1873).

Web'ster, Daniel, an American orator and politician, was born 18th January 1782, at Salisbury, New Hampshire. His father was a farmer who had risen to the rank of captain in the army during the Revolutionary War. He himself was during his boyhood engaged in agricultural work in summer, and only attended school in winter. At length, however, after a few months at Exeter Academy, he entered Dartmouth College in 1797, where he acquired a considerable mastery of ancient literature and the English classics, supporting himself meanwhile mainly by teaching. He graduated in 1801, then entered a lawyer's office, studied law for four years, and was admitted to the bar in 1805. He commenced practice in Boscawen, New Hampshire, but afterwards removed to Portsmouth. W. now began to take part in political life, warmly espousing the cause of the Federal party, but did not obtain a seat in Congress until 1812, when attention was attracted to him by a fine oration in opposition to the war policy of the Government. A speech on the Berlin and Milan decrees, delivered in June 1813, was his maiden effort in Congress, and he rapidly rose to a front rank among the members of his party. At the same time he assiduously cultivated his profession, making Boston his place of business, and becoming one of the most distinguished lawyers of the day. On the 22d December 1820—the bi-centenary of the landing of the Pilgrim Fathers—he delivered an oration at Plymouth which added greatly to his fame as an orator. In 1823 he finally established his reputation by a great speech on the Greek Revolution. In 1827 he was transferred from the House of Representatives to the Senate, where he sat until 1841. One of his most famous political speeches was delivered on the 26th and 27th January 1830, in reply to a South Carolina senator who had mooted for the first time the question of 'nullification,' or the right of a State to refuse obedience to the decisions of the central government. About this time the powerful Whig party began to be formed, its leaders being W. and Henry Clay (q. v.), two men of almost equal eminence. Perhaps it is to this fact, and to the divided allegiance of the party resulting from it, that the failure of either to attain the Presidency is to be attributed. From March 1841 to May 1843 W. held the office of Secretary of State, in which capacity he negotiated the famous Ashburton Treaty with England. He generously but unsuccessfully supported Clay's candidature for the presidency in 1844, and was himself disappointed of nomination in 1848. In the struggles as to the admission of Texas and California he adopted strongly the Northern or anti-slavery side, though his support of Clay's compromise measures in 1850 lost him his popularity with the Abolitionist party. He was again defeated in the presidential election of 1852, and died at Marshfield, Massachusetts, on the 24th October of the same year. Besides the speeches mentioned above, the following are among his most famous orations:—An address at the laying of the foundation of the Bunker Hill Monument, Boston, June 17th, 1825, and another on the completion of the monument in 1843: a panegyric upon Adams and Jefferson, who both died on the fiftieth anniversary of American Independence, delivered in Faneuil Hall, Boston, in 1826: and an address on the laying of the foundation of the Capitol extension at Washington, 4th July 1851. See *The Speeches, &c., of D. W.*, edited by Everett (Boston 1851); *Private Correspondence of D. W.*, edited by his son Fletcher (Boston 1857); Lanman's *Private Life of D. W.* (New York 1852; Lond. 1853); *Life and Memorials of D. W.* (New York 1853); Curtis's *Life of D. W.* (New York 1869); Marsh's *D. W. and his Contemporaries* (New York 1876); Smucker's *Life, Speeches, and Memorials of D. W.* (Phil. 1877); and Harvey's *Reminiscences of D. W.* (Bost. 1877).

Web'ster, John, an English dramatist, born in the latter part of the 16th c., wrote plays partly in conjunction with Dekker (q. v.). He lived on into the period of the Commonwealth, and died about 1654. His chief original dramas are *The White Devil, or Vittoria Corombona* (1612), and *The Duchess of Malfi* (1619). Both are full of tragic pathos and exquisite description, and secure for their author a high place among the selecter spirits of the Elizabethan age. Other productions of W. are *Guise, or the Massacre of France, The Devil's Law-Case, Appius and Virginia*. A collected edition of W.'s works, with a biography of the dramatist, was published by the Rev. Alexander Dyce (4 vols. 1830); and another by Hazlitt (4 vols. 1857-58).

Web'ster, Noah, an American lexicographer, was born at Hartford, Connecticut, 16th October 1758. He matriculated at Yale College in 1774, and graduated in 1778, his college career having been interrupted by a short campaign in the Revolutionary War under the command of his father, who was a militia captain. He was admitted to the bar in 1781, but instead of practising law opened a classical academy at Goshen, in the State of New York. Between 1783 and 1785 he published, in three parts, a *Grammatical Institute of the English Language*, which he afterwards made the basis of his famous *Spelling-Book*, of which 70,000,000 copies are stated to have been sold. His pamphlet, entitled *Sketches of American Policy*, published in 1785, was devoted to furthering the scheme for a United States Constitution; and when the Constitution was at last promulgated in 1787, he published an *Examination of its Leading Principles*. He was at this time principal of an academy in Philadelphia, but in the following year he went to New York and established an unsuccessful magazine known as *The American*. In 1789 he began to practise law at Hartford, and in this year were published his *Dissertations on the English Language*, a series of lectures which he had delivered in the Atlantic cities in 1786. After passing four years at Hartford, he returned to New York and started a daily newspaper, the *Minerva*, with a bi-weekly edition called the *Herald*, both of which still exist under the names of the *Commercial Advertiser* and *New York Spectator* respectively. The appearance of yellow fever in New York led him to publish in 1799 his *Brief History of Epidemics and Pestilential Diseases*. He had now settled at New Haven, and devoted himself almost

entirely to grammatical and philological labours. He published a *Compendious Dictionary of the English Language* in 1806, and a *Philosophical and Practical Grammar* in 1807; and shortly afterwards commenced his great work, the *American Dictionary of the English Language*. Finding his philological acquirements inadequate, he devoted himself for ten years to a study of etymology, forming a MS. *Synopsis of Words in Twenty Languages*. Seven more years were occupied in the actual compilation of the dictionary, his final researches being carried out in Paris and Cambridge, where he spent nearly a year in 1824-25. An edition of 2500 copies was published in America in 1858 (2 vols. 4to), and was followed in the next year by an English edition of 3000 copies. A second edition revised by himself was published in 1840-41, a third in 1847, a fourth in 1859, and a fifth, revised by Dr. Porter and containing 114,000 words, in 1864. W. published in 1833 an edition of the Old Testament, 'with amendments of the language,' and in 1839 a similar edition of the New Testament. In 1838 he revised *A History of the United States* which he had written in early life, and in 1843 published *A Collection of Papers on Political, Literary, and Moral Subjects*. He died at New Haven, 28th May 1843.

Wedge, in geometry, is a triangular prism, possessing therefore five sides, the two opposite sides of which are triangles connected by three rectangles. In mechanics the name is given to a similar shaped instrument which is effectual in splitting, cutting, or piercing. Axes, knives, pins, and needles are all of the nature of the W., the principle of which is identical with the principle of the inclined plane. The force which is applied to the *back* of the W. as it is being driven in has to overcome only the friction of the materials and the portion of the total pressure which is resolved perpendicular to the back. But as the total pressure is perpendicular to the faces, which are usually inclined at a large angle to the back, it is evident that this resolved portion is small.

Wedg'wood, Josiah, the founder of English pottery, was born at Burslem, Staffordshire, 12th July 1730. The descendant of a long line of potters, he entered his father's business, and, with the scantiest education, at once entered on his career as an inventor. He discovered new species of earthenware and porcelain, and such was the importance of these discoveries that in a few years they led to the export in place of the import of the finer earthenwares. In 1763 he obtained a patent for a fine cream-coloured porcelain, called 'Queen's Ware,' after Queen Charlotte, and his subsequent experiments added in all ten other different species of ware to the English manufacture, including the fine black 'basaltes' or 'Egyptian' and the famous 'jasper.' By attending carefully to design, and employing recognised artists, among them Flaxman, he raised to the level of a fine art what he had found little better than a barbarous expedient. At Chelsea he had a branch establishment for the painting and finishing of his wares, and in London a saleroom, which became a well-known resort of the fashionable. He received large orders from various parts of Europe, and one of his chief patrons was Catherine II. of Russia, for whom he executed a splendid 'landscape' service of many hundred pieces. In 1769 he removed his works some distance from Burslem, and the village which sprang up beside them he named Etruria. Here he reaped the magnificent fruits of his labours, and died January 3, 1795. W., beyond his own business, was a man of insight and ingenuity, well versed in several branches of natural philosophy. He invented a thermometer for measuring the higher degrees of heat required in the various arts, and the pyrometer, and adapted the engine-lathe to the uses of his art. The best period of his art is from 1779 to 1787, when the jasper ware—blue, with white figures in relief—attained its greatest beauty. The prices of W. ware have greatly increased; an Etruscan inkstand sold in Stafford for fourpence was bought in 1869 for £5, and copies of the Portland Vase have advanced from £40 to £180. W. was a Fellow of the Royal and Antiquarian Societies. Benevolent, pure-minded, ingenuous in private life, he took an active interest in public affairs, being chiefly instrumental in carrying out Brindley's Grand Trunk Canal, which unites the Trent, Severn, and Mersey. See Miss E. Meteyard's *Life of J. W., with an Introductory Sketch of the Art of Pottery* (2 vols. Lond. 1865-66), *A Group of Englishmen, being Records of the Younger Wedgwood[illegible] their Friends* (Lond. 1871), *W. and his Works* (Lond. 1[illegible]) and a *Handbook of W. Ware* (Lond. 1875); also a paper [illegible] Right Hon. W. E. Gladstone's *Gleanings* (Lond. 1879). For a description of W. Ware see article POTTERY.

Wed'more, a Somersetshire parish, lying on a southern slope of the Mendip Hills, 8 miles W.N.W. of Wells, has an interesting 14th c. church, with fragments of early sculptures resembling those of the nave of Wells cathedral. But older than its church is an underground chamber, discovered in 1878 in a field called the 'Court Garden' which, probably marking the site of Alfred's palace, carries us back to the Peace of W., concluded in 878 between Alfred (q. v.) and Guthrum of East Anglia. By this, 'the culminating event of Alfred's reign,' following as it did his defeat of the Danes at Ethandun, the Northmen agreed to evacuate Wessex and the part of Mercia S.W. of Watling Street, England being thus divided into *Engla-lagu* and *Dena-lagu*, while their king was baptized at Aller in the font restored last year to Aller church, and from *Guth-orm*, 'the fighting-dragon,' became Æthel-stán, 'the stone of excellence.' On 7th August 1878 the Millenary of the Peace was celebrated at W., and reference may be made to the reports of the Somersetshire Archæological Society for the speeches of Bishop Clifford and others on that occasion, as also to Professor Earle's *Peace of W., and how it touches the History of the English Language* (Oxf. 1878).

Wednes'bury (Old Eng. *Wodnesbeorh*), a manufacturing town of Staffordshire, 8 miles N.W. of Birmingham by rail, is an ancient place, since here in 914 Ethelfleda, Edward the Elder's sister, founded a castle. The present town, however, is almost wholly modern, the only old building being the church of St. Bartholomew crowning the former castle-hill. There are many new churches and chapels, and a free library and public baths were opened in 1878. W. owes its importance to its situation in the S. Staffordshire coal-field, whose yield in 1877 was 15,960,550 tons, and it is one of the great iron towns of the Black Country, manufacturing railway plant, gas tubes, gun-locks, &c. W. publishes three weekly newspapers, and with West Bromwich, Tipton, and Darlaston returns one member to Parliament. Pop. (1811) 5272 (1871) 25,030.

Wednes'day. See ODIN.

Wee'bo, or I'bo, one of the Querimba Islands, close to the coast of Mozambique, and about 170 miles N. of the town of that name. It belongs to Portugal, is fortified, and has some trade in ivory and gums, chiefly with Marseilles. The imports in 1875 were valued at £10,882, and the exports at £24,179. Pop. about 3000.

Weed, Thurlow, an American politician, born at Cairo in the state of New York, November 15, 1797, was first a cabin-boy on a Hudson river-boat, then a compositor, served as a volunteer in the war of 1812-15, established (1818) a newspaper, the *Agriculturist*, at Norwich in his native state, and was twice elected (1826-30) to the New York Assembly. In 1830 he settled at Albany, where he founded the *Evening Journal*; was one of the first members of the Whig party, and materially helped in the election of Governor Seward (1838 and 1840) and of Harrison to the Presidency (1840). His reputation as an adroit and successful wire-puller was now at its height, and he exercised a great influence in the distribution of 'the spoils of the victors,' but did not accept office. W. was an energetic supporter for the Presidency of Taylor (1848), of Scott (1852), of Seward (1856 and 1860), but gave a hearty adhesion to Lincoln when the latter was chosen, urged the vigorous prosecution of the war (1861-65), settled in New York (1865), and withdrew from editorial work (1868), though he still continued a vigilant guardian of the interests of his party, and was especially active during the constitutional crisis of 1876. He died in 1878. W. made some slight contributions to literature, but his autobiography and correspondence (not yet published) will unquestionably furnish invaluable material for the political history of the United States during the last fifty years.

Weeds are any plants which come up where they are not wanted, so that flower-garden plants among kitchen-garden crops, and carrots or turnips in flower-borders, are in this sense W. W. are mostly quick growers and very prolific, and in cases where they have had undisturbed possession they have crushed out native vegetation—*e.g.*, imported thistles in parts of S. America. The flora of highly-cultivated countries is gradually

being altered by agrestial W. introduced with cereal and other seeds from abroad.

Week (Goth. *vikô*; Low Lat. *septimana*; Gr. *hebdomas*; Heb. *shebua*, from *sheba*, 'seven'), with early Teutonic races, a period probably of the fourteen nights between a new and a full moon, since the Babylonian seven-days' cycle, introduced from Egypt to Rome in the 2d c. A.D., was not received by the heathen Franks till two centuries later. Under SABBATH the origin has been traced of this seven-days' week, which with the spread of Christianity supplanted the Greek *decades* and Latin *nundinæ*, and through Islam has found its way to Central Africa. Similarly the nomenclature of the seven days after the seven known planets reached Rome from Alexandria, and spread from Rome to the Roman and Teutonic races, the latter Germanising the Latin forms. Of Christian origin are the Gr. *kyriakē*, Lat. *dies dominica* (Fr. *Dimanche*), *Sabbath*, and *Lord's Day*, as also the Ger. *Sonnabend* and *Samstag* ('vigil of Sunday,' or the Sabbath); and, in German, *Mittwoch* has wholly superseded the older *Wodanstag* or 'Wodan's day.'

Weeks, Feast of. See PENTECOST.

Weep'ing Trees is a name given to certain trees having drooping secondary branches and remarkably long and pendulous branchlets, in consequence of which they possess a peculiarly graceful appearance, and form a pleasing contrast to trees of normal habit. For this reason and for shade W. T. are often planted as embellishments of gardens and pleasure-grounds, the custom not being confined to Western nations, but much in vogue also among the Chinese and their neighbours. The weeping willow is a general favourite, and in this species the habit is constant; but the weeping forms of British willows, ash, and elm are casual sports, and are propagated by grafts, &c. The weeping birch is not uncommon in a state of nature among the Scotch hills.

Weerdt, a town in Limburg, Holland, on the Südwillemsvaart Canal, 12 miles W.N.W. of Roermond. It has a fine church, containing the grave of Count Philip of Hoorn, a Franciscan monastery, and good schools, and carries on considerable brewing and tanning. Pop. (1874) 7073.

Wee'ver (*Trachinus*), the name given to certain species of *Teleostean* fishes, belonging to the family *Trachinidæ*, in which group the body is long, and may be either naked or scaly. The ventral fins are placed beneath the pectorals, and the palate bears teeth in the typical genus. The great W. (*T. draco*) and lesser W. (*T. vipera*) are the two familiar species occurring on British coasts. The former fish attains a length of from 10 to 16 inches. The colour is a reddish grey above, tinted with brown, the abdomen being of a lighter colour, and the gill-cover marked with yellow. The name 'W.' is a corruption of the French *La Vive*, given to the fish in allusion to the persistence of its vitality when removed from the water. The names Sea-cat and Sting-bull are applied to the great W., whilst the little W. is called Sting-fish and Otter-pike. The spines of the gill-cover and of the first dorsal fin are capable of inflicting sharp and painful wounds, which may exhibit inflammatory symptoms, due probably to some irritant secretion from the skin of the fish. The lesser W. attains a length of 5 or 6 inches; its colour is a reddish brown on the back and silver grey below. The lesser W. buries itself in the mud or sand, and also stings severely, bathers not unfrequently suffering from the effects of the wound.

Wee'vil, the name specially given to a family (*Curculionidæ*) of beetles or *Coleoptera*, the larvæ of which are highly destructive to grain and to various plants. The head is prolonged to form a snout or proboscis, used for boring, the antennæ being placed at about its middle. The mouth-parts are rudimentary, and are at the top of the snout. The family includes many species, a large proportion being very small. The larvæ are fleshy, footless grubs, and have large jaws; they enclose themselves in silky cocoons. Of the W. the best known have been described in special articles, such as Corn W., Pea W., &c. But mention may here be made of certain species belonging to less familiar genera than those just mentioned. The genus *Brenthus* or Oak W. bores, in its larval stage, into the white oak. The Seed W. are included in the genus *Apion*, and have black, pear-shaped bodies. *A. Sayi* lives in the pods of the wild indigo. *Rynchites* is another well-known genus, of which *R. bicolor* injures roses. The Nut W. belongs to the genus *Balaninus*. The snout is slender in the latter group, and is nearly as long as the body. The Pine W. belongs to the genus *Xylobius*, and *X. pales* is destructive to the pitch-pine especially. The White Pine W. is the *Pissodes strobi*, a species highly destructive to the tree from which it takes its name. The Plum W. (*Anthonomus prunicida*) is an American pest, whilst *A. quadrigibbus* infests the apple, and *A. suturalis* the cranberry. Another Plum W. is the *Conotrachelus nemephar*. The genus *Calandra* includes the famed *C. granorum* or Grain W., and the *C. palmarum*, which infests palms. Other species of W. are the *Sitophilus oryzæ* or Rice W., the Grape W. (*Cæliodes inæqualis*), and the Potato-stalk W. (*Baridius trinotatus*), the last of which infests the stalk of the potato-plant, and causes the death of the plant.

Weft is the name of the yarn or thread which is shot in a shuttle or otherwise across the warp or web in Weaving (q. v.).

Weight of a given body is the force with which that body is attracted to the earth, and is, in accordance with Newton's Second Law, measured by the product of the mass into the acceleration. For all bodies at the same distance from the earth's centre the acceleration is the same; and hence the W. is simply proportional to the mass. Consequently we may compare masses by comparing their weights; and this is really what is done in all operations of *weighing*. Thus, if two masses are suspended at the extremities of an equal-armed lever, the lever is in equilibrium; hence the weights acting at the extremities, and therefore the masses, must be equal. This is the principle of the ordinary Balance (q. v.). The W. of a mass may also be estimated by means of a spring-balance. See SPRING. See also GRAVITY.

Weights and Measures. Under this heading it is usual to consider the various standards of mass and length which are or have been used amongst civilised communities. To compare any two quantities of the same kind, it is necessary to express them in terms of a common unit (see UNIT), and upon the choice and definition of this unit the character and accuracy of our comparisons must depend. Originally, no doubt, the standards of length were taken from the different parts of the human body, as the names foot, digit, palm, span, cubit, ell, &c., imply, and as we may safely infer from the word grain, the standards of mass were chosen from some common convenient and tolerably definite source, such as afforded by grains of barley or other cereal. As the intercourse between nation and nation increased and commerce arose it became necessary to fix more definitely the standards of reference, and not the least service rendered to civilisation by the Romans was the construction of a universal system of W. and M. which all their subjects were forced to use. At the decline of the Roman empire, however, the imperial standards were lost, and each community, retaining the old names, formed its own local standards. And in this we find the explanation of the existence throughout Europe of such words as mile, pound, ounce, applied to similar though quantitatively different standards of length and mass. This multiplicity of standards became confusing and inconvenient as the small independencies of the dark and middle ages merged into the Great Powers which now rule the continent of Europe; and simultaneously the rapid rise of commerce required a readjustment in the way of simplification of these standards. Henceforth the fixing of legitimate W. and M. became a subject of Government legislation, and, with the increased demand for accuracy, a scientific problem of no small difficulty. As in all practical applications of pure science, France led the way, and in 1795 established the Metric System (q. v.) of W. and M. as the only authorised system throughout her dominions. The fundamental standard of this system, the mètre, though originally derived from Delambre and Méchain's measurement of the size of the earth as a ten-millionth part of a quadrantal arc from pole to equator, is practically defined as the distance between the ends of a rod of platinum at 0° C. Similarly are all the national standards of length defined, including our own Yard (q. v.). The units of mass, such as the British Pound (q. v.)[illegible]he French kilogramme (see METRIC SYSTEM), are in[illegible]anner fixed by material standards, generally a mass of pl[illegible] preserved in the Government offices. Copies

are made of these definite standards, so that should the standards by any accident be destroyed or damaged it shall be a comparatively easy matter to restore them. All other measures, whether of mass, length, or capacity, can be and are now defined in terms of the fundamental standards of mass and length; but for these we refer to special articles, such as AVOIRDUPOIS WEIGHT, FOOT, GALLON, GRAIN, GRAMME, INCH, OUNCE, TROY WEIGHT, &c., besides those already indicated. In connection with the W. and M. Act of 1878, an Order of Council (February 4, 1879) has been issued, establishing the *Cental* of 100 lbs. avoirdupois as the new standard hundredweight.

Law Regarding W. and M.—Various recent statutes have been passed with a view to establish uniformity in the W. and M. of the United Kingdom. The most recent is the 41 and 42 Vict. (1878), which came into force January 1, 1879. By these statutes an imperial standard yard, pound, gallon, and bushel is fixed. All local measures of capacity are abolished. The imperial standard gallon is 277·274 cubic inches. The legal stone is fixed at 14 pounds avoirdupois. All articles sold by weight must be sold by avoirdupois, except gold, silver, platina, and precious stones, which are still to be sold by troy weight. Any one who uses or has in his possession for use for trade a weight or measure which is not of the denomination of some Board of Trade standard, shall be liable to a fine not exceeding £5.

Weil, Gustav, a celebrated living Orientalist, born of Jewish parents at Sulzburg in Baden, April 24, 1808, studied at Heidelberg (1828–30), at Paris, and at Cairo, where he resided for five years. In 1838 he became librarian at Heidelberg University, in 1845 extraordinary Professor, and in 1861 ordinary Professor of Oriental Languages. His works are *Goldene Halsbänder* (Stutt. 1836), a translation from Zamachschari; *Die Poetische Literatur der Araber* (Stutt. (1837); *Tausend und eine Nacht* (4 vols. Stuttg. 1837–41), the best German translation of the famous tales; *Einleitung in den Koran* (Bielef. 1844; 2d ed. 1878); *Mohammed, der Prophet* (Stuttg. 1843); *Geschichte der Khalifen* (Mannh. and Stuttg. 3 vols. 1846–51), with its continuation, *Geschichte des Abbassidenkhalifats in Ægypten* (Mannh. and Stuttg. 2 vols. 1860–62); his translation, *Leben Mohammeds nach Mohammed Ibn Ishak, bearbeitet von Abd-el-Malik Ibn Hisham* (Mannh. and Stuttg. 2 vols. 1864); and his *Geschichte der Islamischen Völker von Mohammed bis zur Zeit des Sultans Selim* (Mannh. and Stuttg. 1866), the result of thirty years' historical study.

Wei'mar, capital of the Grand Duchy of Saxe-Weimar-Eisenach, on the left bank of the Ilm, about 110 miles W.S.W. of Leipzig. The grand-ducal palace, rebuilt under Goethe's direction 1790–1803, contains many curiosities and works of art commemorative of the four great poets who have given W. its celebrity—Goethe, Schiller, Herder, and Wieland, besides the original cartoons of Leonardo da Vinci's 'Last Supper,' and several pictures by Scheffer and other modern artists. Other places of interest are the Rothe Schloss, built in 1574, where the chamber holds its sittings; the so-called Französische Schlösschen, containing the grand-ducal library, with its 150,000 volumes, 8000 maps, and 500 old works on genealogy, &c., besides pictures and busts of Goethe, Schiller, and others, and relics of Luther, Gustavus Adolphus, &c.; the Fürstenhaus, at one time the residence of the Grand Duke Karl August, the munificent patron of the poets, now the central telegraph office; the Stadt-Kirche, erected about 1400, containing Cranach's 'Crucifixion' and the monuments of Herder and Duke Bernhard; the museum (1869); the theatre, so celebrated under the management of Goethe and Schiller; statues of the four poets and of Duke Karl August, &c. The houses in which the poets lived still stand, but their interest is of course literary, not architectural. Besides the Stadt-Kirche already mentioned, there are various churches of different persuasions in W., a large number of schools, charitable institutions, banks, &c. There are hardly any manufactures. Across the beautiful park to the S.E. lies the village of Ober-Weimar. Pop. (1877) 19,267. W. has never distinguished itself in political history except by the meeting of deputies in 1862 to discuss the unification of Germany. See Schöll's *W., Merkwürdigkeiten einst und jetzt* (Weim. 1857), Springer's *W., Classische Stätten*, (Berl. 1867), and the descriptions of 'Pumpernickel' scattered through Thackeray's Works.

Weingunga (*Waingunga*), a considerable river of Central India, which flows after a S. course of 350 miles into the Wurdha, then called the Pranheta, a tributary of the Godavery. It is navigable for some distance during the rains.

Weir, or **Wear**, a dam or dyke thrown across a river or stream to raise the level of the water for the purpose of diverting it to drive machinery, irrigate land, or supply towns, or to render the upper portion of the stream navigable, or for some other purpose. A W. is constructed of stone, or, as in America, of timber, crossing the river at right angles or obliquely. Sometimes it takes the form of a V, the apex pointing up the river. The up-stream face is vertical or nearly so, and the down-stream face slopes gently or is cut into a series of steps which break the overflowing water into a number of diminutive cascades. Great engineering skill is required for the construction of a W. The term W. is also applied to an escape-pipe for carrying off surplus water from a reservoir.

Weiss'enfels, a town of Prussia, province of Sachsen, on the Saale, 12 miles S. of Merseburg by rail. It is surrounded by walls, outside of which are the ruins of an old castle of the Dukes of W., now used as a barrack. W. has two churches, a teacher's training-school, and a deaf and dumb institution, manufactures of sugar, machinery, porcelain, leather, jewellery, and bijouterie, much of which goes to the Leipzig fair, and (in the neighbourhood) sandstone quarries. Pop. (1877) 17,904. See Sturm's *Chronik der Stadt W.* (W. 1846).

Welch, John, D.D., a Scottish divine, son of the proprietor of Collieston in Nithsdale, was born about 1570, spent part of his youth in the society of Border thieves, and 'lived for a time entirely by plunder,' but growing ashamed of his wickedness, was reconciled to his family and studied for the church. Ordained minister at Selkirk before he had reached his twentieth year, he was successively called to Kirkcudbright and Ayr, where he proved himself a bold and successful preacher of the gospel. His opposition to James VI.'s arbitrary policy led to his imprisonment (1605), and banishment (1606) from the kingdom. He sought refuge in France, and became pastor of a Protestant congregation first at Nerac, and afterwards, for sixteen years, at St. Jean d'Angely, in Lower Charente. Owing to declining health, he obtained permission to return to England, and died in London 1623. His wife, Elizabeth Knox, third daughter of the great reformer, died at Ayr in January 1625.

Welck'er, Friedrich Gottlieb, classical archæologist, was born at Grünberg, November 4, 1784, studied at Giessen, and visited Rome in 1806, where he became acquainted with Zoega. In 1809 he was appointed extraordinary Professor of Archæology at Giessen, in 1816 Professor of Philology at Göttingen, and in 1819 at the newly-founded University of Bonn. In 1826 and again in 1832 his political writings brought him under suspicion, and he was tried for sedition, but was on both occasions acquitted. He died December 17, 1868. To W.'s rare union of æsthetic feeling with profound and exact learning, philology owes much. His chief works are *Die Aeschyleische Trilogie* (Darmst. 1824); followed by the supplement occasioned by G. Hermann's attack upon his theory, *Nachtrag nebst einer Abhandlung über das Satyrspiel* (Frankf. 1826); *Die griech. Tragödien mit Rücksicht auf den epischen Cyklus* (3 vols. Bonn, 1839); *Der epische Cyklus, oder die Homerischen Dichter* (2 vols. Bonn, 1835–49); *Griech. Götterlehre* (3 vols. Gött. 1857–62); *Alte Denkmäler* (5 vols. Gött. 1849–64); and *Kleine Schriften* (5 vols. Bonn, 1844–67).—**Karl Theodor W.**, brother of the preceding, was born at Oberofleiden, in Ober-Hessen, March 29, 1790, studied at Giessen and Heidelberg (1807–11), and became in 1814 Professor at Keil, in 1816 at Heidelberg, in 1819 at Bonn, and in 1823 at Freiburg. In 1831 he entered the Baden Chamber, where he soon became leader of the Liberals. In 1833 he was suspended, was restored in 1840, again suspended in 1841, became in 1848 representative of Baden at the German National Assembly, from which he withdrew in June 1849, and next year entered the Baden Chamber. He died at Heidelberg, March 10, 1869. W. edited with Rotteck the *Staatslexikon* (12 vols. Altona, 1834; 3d ed. Leip. 1856–66).

Weld, Would, or **Woold**, is *Reseda Luteola*, a glabrous annual or biennial plant of from 2 to 3 feet high, a native of Europe, N. Africa, and W. Asia, and frequent on waste ground

through the British Isles, showing a preference for calcareous soil. It also bears the name of Dyer's Weed or Rocket, and Yellow Weed, from its being used by dyers to dye woollen stuffs yellow, and from the linear-lanceolate undivided leaves resembling those of the genuine rocket. W. is not now so extensively employed for dyeing purposes as formerly. The pigment pervading the whole plant has been named 'Luteolin.' To obtain it in its fulness the W. must be cut before the fruit commences to develop, and to extract the whole yield boiling for nearly an hour is necessary. A paint is also made from it called 'Dutch-pink.'

Weld'ing, the process of uniting two or more pieces of a fusible material by heat and hammering or pressure. Few metals except iron have the property of being welded. Horn, tortoise-shell, and some other substances, may likewise be completely united by heat.

Welhaven, Johan Sebastian Cammermejer, a Norwegian poet, born 22d December 1807 at Bergen, studied at Christiania from 1825, where he became 'Lector' in 1840, and 1846 Professor of Philosophy. His first appearance in literature was closely connected with the political and literary ferment which about 1830 produced a new epoch in the social history of Norway (see NORWAY, *Language and Literature*). The views of W. were fullest expressed in the poem *Norges Dæmring* (Christ. 1834), which with the boldest freedom lashed the weaknesses of the Ultra-Norse School that strove to curb the powerful influence of Danish culture. Before this he had written *Fire Dusin Complimenter tie Henrik Wergeland* (Throndhjem 1838) and *Henrik Wergeland's digtekunst og Character* (Christ. 1839), but henceforth from the long and bitter controversy he had now called forth W. in the main held aloof. The chief events of the remainder of his life were the issues of four collections of poems at Christiania in 1839, 1845, 1848, and 1860, marked by great finish of form and beauty of style, and of his *Reisebilleder og digte* (Christ. 1851). Of great merit are his romances *Asgaardereien* and *Eyvind Bolt*, and the short sketches *Holberg* (Christ. 1854) and *Ewald og de Norske Digtere* (*ib.* 1863). W.'s *Samlede Skrifter* are in 8 vols. (Copenh. 1868). He died 21st October 1873.

Welles'ley, Richard Colley, Marquis, an English statesman, and one of the greatest of the governors of India, was the eldest son of the Earl of Mornington, and was born in Dublin, 20th June 1760, nine years before his yet more illustrious brother, the first Duke of Wellington. He was educated at Eton and Christ Church, Oxford, and always retained a rare skill in the composition of Latin verse. After filling some minor offices at home, he was selected as Governor-General of India in 1797, and filled that post for nearly eight years. It was Lord W.'s policy that determined the supremacy of the English throughout India, in contradiction to the views of his two immediate predecessors, and by no means in accordance with the expressed instructions of the Court of Directors in England. During his rule Tippoo Sultan was overthrown and killed at the siege of Seringapatam; the Mahratta power was crushed by the victories of Sir Arthur Wellesley at Assaye and Argaum, and of Lord Lake at Laswaree. The Mogul Emperor was restored to his throne, but became a pensioner of the English government; the Nizam of Hyderabad was diverted from his French alliance, and guarded with a contingent officered by Englishmen. The greater part both of the Madras Presidency and of the N.W. Provinces became English territory, and the political map of India remained almost as he had left it for the next forty years. The principles of his policy have been described as 'the subsidiary system,' in accordance with which every native chief who had yet sufficient power to be formidable was compelled by diplomacy or force to accept an English alliance, guaranteeing to him internal sovereignty, but generally enforcing a cession of territory in order to support a British force. The leading subordinate agents of his policy were men like Malcolm (q. v.), Elphinstone (q. v.), Metcalfe (q. v.), and Munro (q. v.). All his public conduct was on an equally grand scale. He built the present magnificent Government House at Calcutta in 1804, founded the College of Fort William, for the education of civilians and the promotion of Oriental learning, and always opposed himself to the trading monopoly of the Company. It is to the credit of the Court of Directors, who were continually at variance with him on both political and financial questions, that they voted to him on his retirement a pension of £5000, and afterwards a further sum of £20,000, and erected his statue in the India House. He returned to England in 1805, was for a short time (1809) Foreign Secretary, and twice (1821-28 and 1833-34) Lord-Lieutenant of Ireland, where his policy was conciliation. He died at Kingston House, Knightsbridge, 25th September 1842, and lies buried in Eton College Chapel. He had been created Marquis in 1799, but left no sons, and his early title of Earl of Mornington has since been absorbed in that of Duke of Wellington. See a Life by Pearce (3 vols. Lond. 1845); Montgomery Martin, *Despatches, Minutes, and Correspondence of the Marquis of W. during his Administration in India*, and *Mission to Spain* (6 vols. Lond. 1836-88); and Sidney J. Owen, *Selection from the Despatches, Treaties, and other Papers of the Marquis W.* (Oxf. Clar. Press, 1877).

Well'ingborough, a town of Northamptonshire, England, on the Nene, 9 miles N.E. of Northampton by rail. It has a large elegant parish church (restored 1861-74), two other episcopal churches, a town-hall (1821) and corn exchange (1861). Medicinal wells in the neighbourhood give name to the town. Shoemaking is the principal industry, but iron-mining is being rapidly developed, and there is some trade in corn. Pop. (1871) 9385.

Well'ington, a town of Shropshire, England, on the Shrewsbury and Shropshire Canal, 10 miles E. of Shrewsbury by rail. It has 6 churches and chapels and a handsome town-hall and assembly-rooms. The surrounding district is rich in coal and iron, and has numerous mines and limestone quarries. The town is actively engaged in the nail trade and other industries. Pop. (1871) 5926.

Well'ington, a town of Somersetshire, England, 8 miles S.W. of Taunton by rail. It has a beautiful Gothic church and 8 chapels. Woollen goods are manufactured. Pop. (1871) 5119. The place dates from the time of Alfred the Great, and appears in Doomsday Book as Walintone. The Duke of Wellington takes his title from this town.

Well'ington, the capital of New Zealand, is situated near the southern extremity of the North Island, at the head of Port Nicholson, an inlet measuring six miles by five, and forming a magnificent natural harbour. W. was the first settlement of the New Zealand Land Co., and was founded on 22d January 1840. In 1865, on account of its central position, it was made the capital of the colony in the place of Auckland. The town is built on a strip of flat land at the base of steep hills, and is lighted with gas, well supplied with water, fairly paved, and traversed by a line of tramway. In consequence of the frequent occurrence of earthquakes, the houses and public buildings are nearly all of wood. Among the latter the principal are the governor's residence, the Houses of Parliament, colonial museum, an Anglican and a Roman Catholic cathedral (the latter redecorated in 1878). The climate is healthy but boisterous. W. has an extensive commerce, iron foundries, and a patent slip capable of accommodating vessels of 2000 tons. Pop. (at the census of 1878) 19,126.

Well'ington, Arthur Wellesley, Duke of, was born May 1, 1769, or more probably a day or two earlier, at Dangan Castle, County Meath, Ireland, or possibly at Mornington House, Dublin, both the date and the place being subjects of controversy. He was the third son of Garrett Wesley, first Earl of Mornington, and the younger brother of the Marquis of Wellesley (q. v.). The family was descended from two English stocks, the Wesleys of Sussex, and the Cowleys, Coolleys, or Colleys of Rutlandshire, both of which had been settled in Ireland for at least two centuries. W.'s earliest education was received at a private school in England. At the age of twelve he lost his father; and his mother, a woman of strong and even harsh character, who is said to have considered him hopelessly stupid and unfit for any but the most commonplace career, sent him, after a short time at Eton, to the military college of Angers in France, where he studied under the celebrated engineer Pignerol, and completed his education. On the 7th March 1787 he was gazetted ensign in the 73d regiment, and his military career began. In less than a year he became lieutenant in the 76th regiment, was for some time in the 41st, exchanged from the line into the 12th Light Dragoons, and got

his company in the 58th regiment on the 30th June 1791. After passing through the 18th Light Dragoons, he obtained his majority in the 33d regiment, of which he became lieutenant-colonel by purchase in 1793. He had been returned to the Irish House of Commons in 1790 by his family borough of Trim, and in the course of his duties as aide-de-camp to the Marquis of Camden, then Lord-Lieutenant of Ireland, he met and became attached to Catherine Pakenham, third daughter of the Earl of Longford. Their marriage was at that time prevented by family opposition, and it was not until fifteen years later (April 1806) that it was accomplished. He first saw foreign service in 1794, when he took part with his regiment in the Duke of York's disastrous campaign in the Low Countries, where he acquitted himself with credit, but without striking distinction. Thoroughly disgusted, as he had every reason to be, with his first experience in the field, he attempted next year to quit the army and obtain employment in the Irish government service. In this attempt, fortunately for England and Europe, he did not succeed. His regiment formed part of a military contingent destined to co-operate with Admiral Christian in the West Indies in 1795, but the expedition was driven back by storms, and the destination of the regiment was shortly afterwards changed to India. Prevented by ill-health from leaving England with the 33d, W. rejoined it at the Cape, and landed in India in February 1797. The final struggle against the French power was still in progress, and W. was almost as largely instrumental in crushing it in the East as he afterwards was in the West. Under the command of General Harris he turned the right wing of Tippoo Sultan at Malaveli, and thus decided the victory (27th March 1799); he commanded the reserve at the storming of Seringapatam by Baird (4th May 1799); and in the following year he conducted a brilliant expedition against the robber horde of a chief named Dhoondiah Waugh, which was completely successful. The influence of his brother, who was then Governor-General of India, aided him to come to the front, and on the outbreak of the Mahratta War in 1803 he was appointed to a chief command. After reducing the fort of Ahmednuggur, he attacked Scindia's army at Assaye. He had only 1500 British and 7000 native troops, with 17 or 18 guns, while his adversary commanded an army of 50,000 men, with 128 guns. The result was one of the most brilliant of all his victories, and may be said to have been largely due to his personal courage and resolution. The victory of Argaum (q. v.) and the capture of Gawulghur finally crushed the Mahratta power. W. was made Major-General and K.C.B., and returned to England in 1805 with an established military reputation. Entering the House of Commons in the following year, he became in 1807 Chief Secretary for Ireland under the Duke of Richmond, and in the same year he served with distinction under Lord Cathcart in the expedition to Denmark, which ended in the bombardment and capture of Copenhagen.

The most stirring and glorious period of his life was now about to commence—the seven years between 1808 and 1815, in which he vanquished the most famous of Napoleon's generals and finally Napoleon himself, received thirteen times the public thanks of Parliament, and rose through all the grades of the peerage until he became Duke of W., Prince of Waterloo, Duke of Ciudad Rodrigo and Vittoria, Grandee of Spain, Marquis of Torres Vedras, Count of Vimiera, Knight of the Garter and of the Golden Fleece, and Field-Marshal in the armies of England, Russia, Austria, and Prussia. On the 12th July 1808 he sailed from Cork at the head of 12,000 men, and landing at the mouth of the Mondego in Portugal on the 9th August, commenced his march towards Lisbon, which was held by the French under Junot. He defeated the enemy in the skirmishes of Ovios and Roliça and in the great battle of Vimiera, and would probably have taken Lisbon but for the pusillanimity of Sir Harry Burrard, who had been sent out by the Government to supersede him, and who was in turn superseded by Sir Hew Dalrymple. As it was, the extremely unpopular Convention of Cintra was the only result of the campaign. Next year, however, found him commander-in-chief of the troops in the Peninsula, and opposed to Soult and Victor, who held the town of Oporto and the northern province of Portugal. On 12th May 1809, by one of his most brilliant and daring manœuvres, he crossed the broad and rapid Douro in the face of Soult's army and compelled the evacuation of Oporto. On the 27th and 28th July he defeated Victor in the sanguinary battle of Talavera, but was forced to abandon the fruits of his victory owing to the inactivity of the Spanish army under Cuesta. In the campaign of the following year the brilliant Masséna was his opponent. Securing Almeida and Ciudad Rodrigo as bases of operation, the French general compelled W. to retire into Portugal. The victory of Busaco secured for the British their retreat to the strongly-fortified lines of Torres Vedras, before which Masséna soon found himself in a hopeless position. It was equally impossible to force the lines and to maintain his army in the devastated country, so that he in turn had to retreat. W. followed him closely, repulsed an attack at Fuentes de Onoro, and took Almeida (May 1811). Repulsed at Badajos in June, W. turned his attention to Ciudad Rodrigo, which he took after a sanguinary struggle (19th January 1812). He then returned to Badajos, and stormed it also in spite of the most determined resistance (7th April). The French had now lost all hold upon Portugal. Masséna had been superseded by Marmont, who wisely attempted to concentrate the forces which had hitherto been scattered over the wide extent of the half-subjugated country. Salamanca was the point which he determined to hold at all costs. The two armies faced each other, and occupied themselves with manœuvres and counter-manœuvres for more than a month, until at last, on the 22d of July 1812, the decisive blow was struck. Marmont's force amounted to 42,000 men with 74 guns, W.'s to 43,000 English and 3500 Spaniards with 60 guns. The battle was short and fierce, and resulted in the total rout of the French, who lost 6000 men, 2 eagles, and 6 standards. W. now marched upon and took Madrid, and was preparing to advance still further when the stubborn resistance of Burgos checked him, and forced him to retire from Madrid and take up his winter-quarters in the lines of Agueda. He had all along had to contend with insufficiency of supplies and clothing, lukewarmness on the part of the native population, and insubordination among both officers and men, and never were these troubles more aggravated than at this crisis; while a factious opposition at home was attacking his policy and depreciating his triumphs. On the other hand, the disasters of Napoleon in Russia confirmed his hopes of being able to bring the war to a successful close by the expulsion of the French from the Peninsula, and he entered upon the campaign of 1813 with firmness and confidence. Nor was his confidence belied. He completely routed Jourdan and Joseph Bonaparte at Vittoria on the 21st June 1813, taking 151 guns and all the enemy's ammunition, a victory which gained him the rank of Field-Marshal. Pamplona and San Sebastian fell in the course of the autumn, the latter after a determined resistance; and the French, now under Soult's command, after suffering another reverse on the Nivelle (November 10), were fairly driven through the Pyrenees, and the war was carried into their own country. The floods to which the south of France is so subject impeded military operations in the early part of 1814, but on the 10th of April the two armies again faced each other at Toulouse. Napoleon had in fact abdicated and the war was at an end, but intelligence of the event had not reached the generals. The battle was one of the bloodiest of the whole war, and resulted in the precipitate retreat of the French, who nevertheless have more than once claimed it as a victory. On learning of the close of the war W. hastened to Paris, and in the early summer returned to England. It was now that he received his dukedom, but he was not yet permitted to rest upon his laurels. In August he again left for Paris as British Ambassador, and in January 1815 he replaced Lord Castlereagh at the Congress of Vienna. The escape of Napoleon from Elba (March 1815) put a sudden close to the Congress, and W. gave up his diplomatic to resume his military functions. By common consent he was named commander-in-chief of the allied armies in the Low Countries, and assumed the command in Brussels on the 15th of April 1815. Two months later (18th June) was fought the great Battle of Waterloo, the last and crowning triumph of his military career. On June 21 he crossed the French frontier, and on July 3 invested Paris.

During the armed occupation of France W. made Paris his headquarters, and contributed greatly by his firm and judicious policy to the successful re-establishment of the monarchy, moderating at the same time in favour of conquered France the vindictive passions of his conquering allies. To this period belongs one of the gravest charges ever brought against him

—the accusation of lack of generosity in his conduct towards Ney (q. v.)—but to this attempt at detraction no weight is to be attached. Two unsuccessful attempts were made to assassinate him during his residence in Paris, one of them by a man named Cantillon, to whom Napoleon afterwards left a legacy. In 1818 he returned to England, where his wealth had meanwhile increased as largely as his honours. The nation proved its gratitude by more solid proofs than titles. After Talavera he had received a pension of £2000 a year; after the taking of Ciudad Rodrigo another £2000 a year was added; after Salamanca, a sum of £100,000 was voted for the purchase of lands to be held by him. On the close of the Peninsular campaign he received a grant of £400,000; after Waterloo another £200,000. His share of the Waterloo prize-money amounted to £60,000, half of which he gave up to the fund for the widows and orphans. The estate of Strathfieldsaye, in Hampshire, was purchased for him at a cost of £230,000, and Apsley House, in Piccadilly, was built for him at the expense of the nation.

During the early years of the peace he took little part in public affairs. In 1822 he represented England at the Congress on Spanish Affairs held at Verona, and in 1826 he went on a special mission to St. Petersburg. As Master-General of the Ordnance he held a seat in the Cabinet, and frequently took part in debates in the House of Lords, but did not come forward prominently as a politician until in 1827 Canning became prime-minister. He then resigned his seat in the Cabinet and the post of Commander-in-Chief of the Army, in which he had succeeded the Duke of York a few months previously. Being accused in the House of Lords of caballing to obtain the premiership for himself, he proclaimed himself quite unfitted for it and unambitious of it. Yet only eight months afterwards he was called upon by the King to form a ministry, and consented. The sagacity which must be regarded as his leading quality as a statesman, proved to him the impossibility of stemming the tide of the age, and he compromised his severe Tory principles and saved his party for the time by the repeal of the Test and Corporation Acts, and the passing of the Catholic Emancipation Bill—a change of politics which led him into a duel with the Earl of Winchelsea. Though he had thus given way upon the Catholic question, the agitation for Reform was more than he could stomach. After declaring in explicit terms his belief in the perfection of the then existing system of representation, he resigned office (November 22, 1830), and did not resume it until 1834, when he held the whole government in his hands until the return of Sir Robert Peel from Italy, and then took office as Foreign Secretary. His unpopularity during the Reform-Bill struggle was intense—so much so that the windows of Apsley House were broken by the mob, who also hooted him in the streets. It was not until he again compromised his life-long prejudices by promoting the passage of the Corn-laws that he fully regained his hold upon the popular affections. He again became Commander-in-Chief of the Army in 1842, and held the post until his death. Towards the close of his life he retired once more from any active participation in public affairs, though he still attended the House of Lords, and even took part in the debates, his manner of speaking being plain and unstudied, but, it is said, highly effective from its force and earnestness. He was the intimate private friend and confidential adviser of the present Queen, whom he accompanied on a visit to Belgium and the field of Waterloo in 1850. During the latter years of his life his middle-sized but strongly-knit figure, aquiline face, and white hair, were to be seen every day in Piccadilly or Hyde Park, where he took exercise, generally on horseback, with great regularity. In August 1852 he went down to Walmer Castle, where he was entertaining a party of guests. On the 13th of September he was apparently in his usual health, but on the morning of the 14th he was seized with an apoplectic fit, and died on the same evening. After lying in state for five days at Chelsea Hospital, he was buried in St. Paul's Cathedral. The character of W.'s genius is not difficult to apprehend. There was nothing tortuous, astute, or deceptive about it. His courage was immense. No general ever grasped the difficulties of a situation more clearly; his eagle-glance rapidly and thoroughly took in all possible perils and mishaps, yet his sagacity never daunted his resolution. His most momentous military movements were undertaken with a boldness of heart and hope that inspired his officers and troops with unbounded confidence in his success. In the art of strategy he was unsurpassed; he never flattered his troops, but Napoleon himself had less power than the plain Englishman in calling forth heroic valour in every form. England never had before, and may never have again, so illustrious a commander. Of the science of politics he was not a student, but even here the simple greatness of his character displayed itself. He was never a paltry partisan, and he would never stoop to carry on an ignoble and factious strife when the conflict had really closed. Save Nelson's, no name amongst the names of modern warriors is more sacredly shrined in the hearts of Englishmen than that of W.

The lives of W. are very numerous, the principal being those of Wright (Lond. 1839-41), Maxwell (Lond. 1839-41; 6th ed. 1862), Stocqueler (Lond. 1852), Wilson (Lond. 1853-54), Williams and Gaspey (Lond. 1853-56), Ward (Lond. 1852), Maurel (Brussels 1853), Macfarlane (Lond. 1853), Lord F. L. Gower, afterwards Earl of Ellesmere (Lond. 1852), Brialmont (Par. 1856-57; trans. by Gleig, Lond. 1858; condensed, Lond. 1862; popular ed. revised 1875), Yonge (Lond. 1860). The great storehouse of information on his military career is his *Despatches*, edited by Colonel Gurwood (13 vols. Lond. 1834-39; 2d series, 12 vols. Lond. 1844-65), as well as the *Supplementary Despatches, Correspondence, and Memoranda*, edited by his son, the present Duke of W. (of which the 7th vol. appeared in 1878). See also Lamartine's *W. and Waterloo* (Lond. 1852), Lemoinne's *W. from a French Point of View* (Lond. 1852), Timbs' *Wellingtoniana* (Lond. 1853), Lendy's *Campaigns of Napoleon and W. in 1812, 1813, and 1814* (Lond. 1861), Hamley's *W.'s Career* (Edin. 1860), Büdinger's *W., Ein Versuch* (Leip. 1869). On the general history of his career, see Napier's *Peninsular War*, Alison's *History of Europe*, Thiers' *History of the Consulate and Empire*, Sir Robert Peel's *Memoirs*, and the political memoirs of the Catholic Emancipation, Reform, and Corn-Law struggles.

Wellingto'nia represents one of the giants in vegetable life, and is a name given by Professor Lindley to a conifer, native of California, but afterwards it was known to botanists that the tree ranged under the genus *Sequoia*, another species of the genus having been described some years earlier under the name of *S. sempervirens*. The cognomen of W. is 'big tree of California,' and the tree exists over a district of about 200 miles, at an elevation of 4500 to 6500 feet above sea-level in that country. The loftiest specimens attain to a height of 325 feet, with a maximum diameter of 61 feet. They thus surpass in bulk of timber every existing tree, although several species of *Eucalyptus* exceed them in height. The tree is now familiar through being grown as an ornamental plant in gardens and parks in Europe, and has also been introduced into Australia.

Wells, a city of Somersetshire, England, 6 miles N.N.E. of Glastonbury by rail, lies circled by the Mendip Hills, and takes its name from St. Andrew's ancient well. The matchless cruciform cathedral (restored 1842-74) is 371 feet long by 135 across the transepts, and, built between 1206 and 1465, is mainly in the Early English style. Its noblest features are the central (160 feet) and two western towers (130 feet) and—Freeman notwithstanding—the western front, adorned by 153 life-size statues of saints and kings and over 400 smaller figures. The baronial Bishop's Palace, with Jocelyn's 'stately chapel' (1236), the Vicar's Close (1363), the beautiful Deanery (1472), and St. Cuthbert's Church, are among the historic monuments of W.; its later buildings include St. Thomas' (1859), a town-hall (1780), and the county lunatic asylum (1848). Disfranchised in 1868, W. publishes one weekly newspaper, and has breweries, flour and paper mills, &c. Pop. (1871) 4518. See Parker's *Architectural Antiquities of W.* (Oxf. 1866), and Freeman's *History of W. Cathedral Church* (Lond. 1870).

Wells, Charles Jeremiah, born in London in 1800, was educated at Edmonton with Keats's brother, and Horne the author of *Orion*. With Keats himself he grew intimate, and after that intimacy was snapped by a hoax on the poet's brother, it was in rivalry with Keats that he wrote the little prose volume, simple, idyllic, stillborn—*Stories after Nature* (1822). Two years later appeared *Joseph and His Brethren, by 'H. L. Howard,'* the dramatic poem on which Hazlitt remarked: 'By the by, I have read your poem. It shows great genius; and—I advise you to stick to your profession.' Law was the profession, W. being then under articles to a solicitor; but though he hardly stuck to law, he so far followed the advice that he published no more, beyond a *Sonnet to Chaucer*, one *Story after Nature* more,

and two papers on *Boar-Hunting in Brittany*. *Joseph* lay long neglected, by no man more than by its author, who from fishing and boating in S. Wales betook himself about 1840 to Brittany, there raised, it is said, the dead to life by prayer, and finally settled at Marseille, where he died 17th February 1879. But *Joseph* ere that had been brought from prison by Swinburne, whose attention was called to it by D. G. Rossetti, and who, after vainly dwelling, in his *Essay on Blake*, on the 'dramatic language, passion, and characterisation of this great poem,' had the tardy satisfaction of adding to the reprint (Lond. 1876) an Introduction that commanded from the critics an almost unanimous credit of 'the most Shakespearean drama since Shakespeare's day'—no special recommendation, it would seem, to the reading public. See two interesting articles by Mr. Theodore Watts in the *Athenæum* for April 8, 1876, and March 8, 1879. Communications from E. W. Gosse, W. J. Linton, and R. H. Horne on the same subject appeared in the *Academy* for March 1, April 12 and 19, 1879.

Wells, David Ames, D.C.L., born at Springfield, Massachusetts, U.S., June 17, 1828, graduated (1847) at Williams' College, and at the Lawrence Scientific School, Cambridge (1851), where he was assistant-professor (1851–52), became a practical chemist at Boston (1853), a member of the publishing house of Putnam & Co., New York (1857–58), and associate-editor of the *Springfield Republican* (1858). W. was sent to Europe (1862 and 1867) on commissions for the United States Government, was United States Special Commissioner on Revenue (1866–70), during which time he made fifteen valuable reports, was appointed (1872) lecturer on Political Economy at Yale College, visited Europe (1873), succeeded John Stuart Mill as foreign associate of the French Academy of Political Sciences (1874), received the degree of D.C.L. from Oxford University (1874), and has for many years been a zealous advocate of Free Trade. W. is a varied and industrious litterateur. He has edited the *Annual of Scientific Discovery* (16 vols. Bost. 1850–65); C. Knight's *Knowledge is Power* (1856), and Timb's *Things not Generally Known* (1857); and is the author, among other works, of *The Science of Common Things* (1857); *Elements of Natural Philosophy* (1857); *Principles and Applications of Chemistry* (1858); *First Principles of Geology* (1861), and *Our Burden and Our Strength* (1864).

Welsh Language and Literature. See CYMRIC LANGUAGE AND LITERATURE.

Welsh'pool (so called to distinguish it from other 'Pools'; its Welsh name is *Trellyn*, 'the dwelling on the pool'), a town of Montgomeryshire, N. Wales, near the left bank of the Severn, and 19¾ miles W.S.W. of Shrewsbury by rail. It has a parish church (mostly rebuilt, 1774); a Wesleyan chapel (1864) with a spire 70 feet high; a town-hall and market, Classic in style, with a clock-tower 90 feet high (1874); a library and museum (1874), &c.; and 1 mile distant is Powys Castle, with a fine picture-gallery and beautiful park. The manufacture of flannel and woollen goods is the staple industry of W., which with four other towns returns one member to Parliament. Pop. (1871) 7199.

Wendover, Roger of. See ROGER OF WENDOVER.

Wends (in their own tongue *Serbs*), a branch of the West Slavs, now found in Lausitz, the eastern district of Sachsen-Altenburg, and in the country between the Vistula and Persante (where they are called *Kasuben*), and numbering 140,000, of whom 50,737 were (1875) in Saxon Lausitz alone. The Veneti mentioned by the Elder Pliny and by Tacitus, whom Tacitus wrongly includes among the Germans, are usually identified with the W. Their first seats were the banks of the Niemen and Upper Dnieper, but from the 6th c. their name was extended to the North Slavs generally, who then penetrated Bohemia, and occupied all the lands to the N. on the right bank of the Elbe. These divided into several tribes, of which those on the Lower Elbe first came into conflict with the Germans in the time of Karl the Great, those on the Upper Elbe in that of Heinrich I. With the 10th c. began a long and bloody struggle with the Germans, ending in the 12th c. with the final subjugation and Christianisation of the W. Though under the German Empire, they long maintained a separate position under princes of their own. Their nationality was gradually crushed out by German immigration, disappearing first in the districts of the Main, where they had settled in the 8th c. The last woman who spoke Wendish in the island of Rügen died in 1404. The old language still lingers in Lausitz, where six newspapers are published in it, four of these at Bautzen, of which the chief, the weekly *Serbske Nowiny*, sells 2000 copies. It is edited by J. E. Schmaler, the joint-editor with Haupt of an invaluable collection of Wendish folk-songs and tales. See L. Giesebrecht, *Wendische Geschichten aus den Jahren 780–1182* (3 vols. Berl. 1841–43); R. Andree, *Das Sprachgebiet der Lausitzer Wenden* (Leip. 1873); and *Wendische Wanderstudien* (Stüttg. 1874).

We'ner, Lake, the largest lake in Sweden, lies in the S.W. of the country, between the *läns* of Vermland, Elfborg, and Skaraborg, 144 feet above the sea. Length, 137 miles; breadth, 68 miles; area, 2013 sq. miles; greatest depth, 292 feet. It consists of two parts, Lake W. proper, the larger and N.E. part, and Dalbo Lake in the S.W., separated by Vermland's Näs ('Naze') in the N. and Kallan Island in the S. Numerous rocky islands skirt the shores, which are much broken by inlets. Lake W. is fed by about thirty affluents, the largest of which is the Klarelf (248 miles), and is discharged by the Götaelf, which forms the famous Trollhätta Falls. By the Götha Canal W. is connected with Wetter.

Wen'lock, a town of Shropshire, England, 14 miles S.E. of Shrewsbury by rail. It is a large parliamentary borough, including Madley and Brosely. W. proper, commonly called *Much* or *Great W.*, is a small place, consisting principally of two streets. It has an interesting church and town-hall, and the ruins of a great abbey, founded by a Mercian king about 680. The ruins, which are carefully preserved, are of a 13th c. building. Pop. (1871) of parliamentary borough, 21,208; of the parish of W. 2531.

Wen'lock Forma'tion, one of the great subdivisions of the Silurian system, and lying immediately below the highest or Ludlow group. It takes its name from the town of Wenlock near Shrewsbury, where it is typically developed. The highest member of the W. F. is the Dudley Limestone, which stretches in a ridge nearly 20 miles long through Shropshire. It contains numerous concretions, locally termed 'ball stones,' which are often of gigantic size. Fossils are very abundant and well preserved. The crabs include numerous fine species, some of which occur in masses of great extent. Trilobites are also common, one species, the 'Dudley Trilobite,' or *Calymene Blumenbachii* of palæontologists, being especially well known and characteristic. Crinoids, Brachiopods, &c., are also found in profusion in the Dudley Limestone. Next in order we reach the Wenlock shale, which sometimes attains a thickness of 1000 feet, *e.g.* in Wales, where it is quarried for slates and flagstones. It contains graptolites and a few trilobites. Below the Wenlock shale are the Woolhope beds, consisting of limestones, shales, and grits; and again subjacent to these are the purple 'Tarannon shales,' which last, however, are often referred to the Llandovery group. The whole thickness of the Wenlock rocks is probably about 4000 feet.

Wens are encysted Tumours (q. v.), consisting of obstructed and enlarged sebaceous glands, commonly situated on the scalp, though sometimes on the face, neck, and shoulders. In general, they are better left alone; but they are sometimes so large as to necessitate operative interference. In operations on the scalp, and more especially in the case of W., there is always considerable danger from erysipelas, and hence it is desirable to see that the patient is in good health, and that he does not expose himself injudiciously to any risk, or indulge in any excess, after the operation. The cyst should be removed entire, as any portion left may reproduce the secretion, and prevent the healing of the wound. If there is reason to dread erysipelas, it is safer to remove the wen by caustic, *i.e.*, to destroy the skin over the tumour to a sufficient extent with some caustic, and then either to leave it to discharge itself, or to destroy it by renewed applications of the caustic to its interior.

Wen'tletrap (*Scalaria*), a genus of *Gasteropodous* Mollusca, belonging to the family *Turritellidæ* (q. v.). The shell is turreted, ribbed externally, and has many whorls. The aperture is round. Of the wentletraps the most famous species is the *S. pretiosa*, or Precious W., a fine specimen of which sold in the days of conchological mania for £50 and upwards. The precious W. is of

pure white colour, and occurs in tropical seas. The Common W. of the British coasts is the *S. communis*, found of a dull-white hue, but often of a brownish colour. In the true W. the whorls are not united; the shells which resemble them, and have contiguous whorls, being designated 'False Wentletraps.'

Wer'dau, a town of Saxony, on the Pleisse, 49 miles S. of Leipzig by rail. It is chiefly notable for its manufactures. Woollen goods, nets, machinery, and tiles are made, and there are also iron-foundries, flour-mills, &c. Pop. (1875) 11,689.

Wer'den, a town of Rhenish Prussia, on the Ruhr, 16¾ miles N.E. of Dusseldorf by rail. It has a Catholic and an Evangelical church, and manufactures of cloth, felt, shoes, brushes, locks; also spinning, weaving, dyeing, and brewing. There are coal-mines in the neighbourhood. Pop. (1875) 6746. In the Abbey of W., founded in 778, there was discovered in the 16th c. the famous *Codex Argenteus*. See ULFILAS.

Wer'geland, Henrik Arnold Thaulow, a Norwegian poet, was born at Christiansand, 17th June 1808, and graduated at Christiania in 1829. His early sympathies were fired by the July Revolution in France, the struggles of the Poles, and the rise of Democratic sentiment in Norway. Liberty and Reason became his guiding-stars in politics and religion, and he followed their guidance with all the force of genius and the enthusiasm of a poet. His first works were the so-called farces of 'Siful Sifadda,' *Ah!* (1827), and *Irreparabile Tempus* (1828), and *Digte, förste Ring* (1829). In the latter year W. entered public life as one of the most eloquent opponents of the Conservative party. His religio-philosophical poem, *Skabelsen, Mennesket, og Messias* (1830), called forth the sharp criticism of Welhaven (q. v.) in 1832. W. was for some time editor of *Folkebladet*, and from 1835 to 1837 of *Statsborgeren*; and after the dissolution of the popular parliament in 1836 published a large number of violent party songs and pamphlets. His *Digte, anden Ring*, and the drama *Barnemordersken* (1835), are full of the noblest lyric diction, and show a great advance on his earlier works in clearness. But W.'s style was at best too difficult to be popular with the vulgar, as his genius was too original to be the organ of any party. The friendly offices of King Karl Johan gradually won him over to the court; in 1839 a pension from the king succeeded in drawing him from the field of politics. To this later period belong some of his best poems, *Jan van Huysums Blomsterstykke, Svalen, Jöden, Jödinden*, and *Den Engelske Lods*. He died of consumption at Christiania, August 12, 1845. His poems are published in 9 vols. by H. Lassen (1852–59), and a selection, *Udvalgte Skrifte*, appeared in 1859. See Gosse, *Northern Studies* (Lond. 1879).

Wer'geld (from *wer*, 'a man,' and *geld*, 'money'), the Old English title of a widespread institution, extending perhaps beyond the Aryan family, which, appealing from love of vengeance to love of gain, allowed a wrong-doer to purchase the life he otherwise had forfeited under a sterner code. It offers itself in its rudest form in the Homeric poems, where the kinsfolk of a slaughtered man seem only to have been bound by custom to take the proffered atonement, nay sometimes are praised for its rejection (*Il.* ix. 628, and vi. 45); in the earliest glimpses of Teutonic law a great advance may be discerned. For here not only has the state interfered to enforce the acceptance of the atonement and assess its amount, but it looks on a crime as done to itself, and so claims for its king or other head a share of the W. Both in the laws of Æthelbert and in those of Ælfred three centuries later we find an elaborate scale of prices, so much for a Briton, so much for an Englishman, so much for a churl, so much for a thegn, so much at last for the king himself. And as the price must always be paid to him who had borne the loss, of a slave for instance to his master, so the king's W. had to be paid both to his kinsfolk and his commonwealth; and English history records two cases where the invading avenger of a royal kinsman slain was stayed by the payment of W.—by the Kentish men for the slaying of Mul, by the Mercians for the slaying of Ælfwine of Northumberland. With the severance of criminal from civil law, and the superseding of compensation by punishment, the W. grew obsolete, and the last recorded instance of its use was when in the reign of Edward IV. Lord Berkeley made the widow of Lord Lisle a money payment for her husband's death. See Freeman's *Comparative Politics* (Lond. 1873).

Wer'ner, Abraham Gottlob, a celebrated mineralogist and geologist, was born September 25, 1750, at Wehrau in Ober-Lausitz, where his father was director of a smelting-work. In 1769 he entered the mining school at Freiberg, studying law and the natural sciences at Leipzig, and in 1775 became professor of mineralogy at Freiberg, where he soon formed a school of geologists and mineralogists who diffused his views over Germany. In this way, though he himself published comparatively little, his theories exercised a powerful influence upon the science of the day. He systematised mineralogy, arranging minerals mainly by their external characters, and laying small stress upon their chemical constitution. From a study of the Tertiary formations in his own district, beyond which he hardly ventured, he generalised a theory of the formation of strata, which his disciples strove hard to reconcile with the geological structure of other and distant regions which they visited. The gist of this theory was that all rocks were sedimentary. His system was vitiated, however, by his basing his classification chiefly upon mineralogical characters, giving small heed to fossil evidences)see GEOLOGY). W. died at Dresden, June 30, 1817. His chief works are, *Ueber die Aüsseren Kennzeichen der Fossilien* (1764), *Kurze Klassifikation und Beschreibung der Gebirgsarten* (1787), *Neue Theorie über die Enstehung der Gänge* (1791), and *Verzeichniss des Mineralienkabinets der Berghauptmann's Pabst von Ohain* (2 vols. 1791–92). See his Life by Frisch (1825) and Configliachi (1827), and Hasse's *Denkschrift zur Erinnerung an W.* (Leip. 1848).

Wernigero'de, a town of Prussia, province of Sachsen, belonging to the counts of Stolberg-Wernigrode, on the slopes of the Harz Mountains, at the confluence of the Zilligerbach and the Holtzemme, 40 miles S.W. of Magdeburg. It has a beautiful 'schloss' containing a library of 69,000 vols., specially rich in collection of Bibles and Hymnologies, a gymnasium, three churches, a Rathhaus dating from the 14th c., and built, as are also many of the private houses, in a picturesque Gothic style, a thiergarten or park, an orphanage, &c. W. has manufactures of linen, cloth, tobacco, and bricks. Pop. (1875) 7580. See Förstemann, *Die Grafl. Stolberg'sche Bibliothek in W.* (Nordh. 1866).

Wer'wolves (Teut. *wer-wulf*, 'man-wolf,' whence Old Fr. *garoul*, now pleonastically *loup-garou*) are defined in Verstegan's *Restitution of Decayed Antiquities* (Lond. 1628) as 'certain sorcerers, who, having anointed their bodies with an ointment which they make by the instinct of the devil, and putting on a certain enchanted girdle, do not only unto the view of others seem as wolves, but to their own thinking have both the shape and nature of wolves, and do dispose themselves as very wolves in worrying and killing, and most of human creatures.' The belief in such monsters was rifest in the great witch era of the 16th c., when the parliament of Franche-Comté passed a law for their expulsion (1573), and when near Köln one Peter Stump, 'for being a werwolf, and having killed thirteen children, two women, and one man, was put unto a very terrible death' (1589). But it existed in ages far remote (*cf.* Herodotus, iv. 105; Virgil, 6th Ecl., &c.), and even to-day is cherished by French and Russian peasants, the latter dividing *volkodlaks* (lit. 'wolf-hides') into voluntary and involuntary undergoers of the transformation. In England, where wolves have been long extinct, a cat or hare usurped their place in the superstition, the name of werwolf only surving in *Kempion* and a few such ancient ballads, while *William and the Werwulf* was rendered from a French romance. At Thurso, an honest fellow, harassed by witches under the form of cats, cut off the leg of one less nimble than the rest; it changed to a woman's leg, and next morning he found the crippled hag, its owner. On a like incident turn many Continental werwolf tales; and similarly the man-hyænas, lions, tigers, or panthers of Asia, Africa, and South America, present a similar uniformity of principle. The Werwolf Doctrine is by Tylor regarded as 'substantially that of metempsychosis, backed by Lycanthropy (q. v.), the mental delusion whose victims imagine themselves transformed into wild beasts. Cox, on the other hand, refers it to the Lycaon myth, arising from a confusion of the Gr. *leukos*, 'bright,' with *lykos*, 'wolf,' an ingenious theory, which fails, however, to account for the wide extension of the belief beyond the Aryan race. See Hertz, *Der Werwulf* (Stuttg. 1862), Baring-Gould's *Book of W.* (Lond. 1865), vol. i. of Cox's *Aryan Mythology* (Lond 1870); vol. i. of

Tylor's *Primitive Culture* (Lond. 1871), Ralston's *Songs of the Russian People* (Lond. 1872), and *Russian Folktales* (Lond. 1873).

We'sel, a strongly fortified town of Prussia, at the confluence of the Rhine and Lippe, 32 miles N. of Dusseldorf by rail. It has five churches, among them St. Willibrord's (1181–1521), and the Metenakirche, with a tower 334 feet high (1472); a Gothic Rathhaus (1390–96), lately restored and adorned with modern statues, a government house, built (1417) by the Archduke Adolf of Kleve, and now the residence of the commandant of the garrison, a gymnasium and other schools, &c. The fortifications consist of various bastions, ravelines, and other outworks, a citadel at the junction of the Rhine and Lippe, and several forts, of which one is on the left bank of the Rhine. The garrison consists of 5 battalions of infantry with artillery. In front of the Berlin Gate stands a monument (1835) to eleven Prussian officers, here shot by Napoleon in 1809. W. has sugar refineries, manufactures of stearine, paper, tobacco, and nails, some shipbuilding, and an active river trade in fish and timber. Pop. (1875) 19,104. Originally a free imperial town, it passed about 1220 to the counts of Kleve, but continued to enjoy many special privileges. From 1614 onwards for two centuries it shared the chequered fortunes of the rest of the Rhine towns. By the Peace of Paris W. was assigned to Prussia. See Wolter's *Reformationsgeschichte der Stadt W.* (Bonn 1868).

We'ser (Lat. *Visurgis*), a river of Germany, formed at Munden in Hannover by the union of the Werra and the Fulda, the former of which rises in the Thuringer Wald (q. v.), the latter in the Rhongebirge. The united stream takes a northward course through Hannover, forming for a short distance the boundary between Westphalia and Brunswick. After passing Bremen it forms the E. boundary of Oldenburg, and enters the North Sea by a shallow estuary E. of the Elbe mouth. Its length is 270 miles. Large ships do not ascend above Bremerhafen, but smaller vessels go up as far as Bremen. A canal connects the W. with the Elbe.

Wes'ley, John, founder of the English Methodists, was born, 17th June 1703, at Epworth, in Lincolnshire, where his father was clergyman. He was educated at the Charterhouse school, and in his seventeenth year entered Christ Church, Oxford. In 1726 he was elected a fellow of Lincoln. After officiating for a short time as his father's curate, W. returned to Oxford, where he became a member of a little devotional society which his brother, **Charles W.** (1708–1788, still remembered for his noble *Hymns*), had established. This was the first germ of Methodism (q. v.). At this time the two Wesleys were much under the influence of William Law (q. v.), author of the *Serious Call*. On 14th October 1735 they sailed for Georgia, bound on mission work. John W. had much intercourse with the Moravians during his sojourn in America, and on his return in 1738 this was continued, till two years later he separated from them. Although to all appearance he had long been an earnest, God-fearing man, he has himself given us the exact date of his conversion—the evening of the 24th May 1738, at a quarter to nine evening, when he felt an irresistible assurance that Christ had taken away his sins. Certainly from this period his profound religious activity begins. He travelled for a while preaching 'repentance and judgment to come,' and when the cold formalism of the established religion quickly changed into angry opposition, he was obliged in self-defence to form his adherents into a regular organisation—in other words, to establish a new sect. On 12th May 1739 the first Methodist chapel was founded. The rest of W.'s life was given to continuous and earnest work in the cause which he had made his own. During over half a century of eager activity 'it was computed that he travelled about 225,000 miles and preached more than 40,500 sermons, not including addresses, exhortations, and speeches.' He died March 2, 1791, and was buried in the City Road Chapel. W. held the evangelical creed with but few modifications, though he recoiled from the extreme deductions of Calvinism. But he breathed into this creed the breath of life. His sermons were simple, straight, direct appeals, spoken from the heart to the heart, without the waste of one superfluous word; hence their extraordinary effect. His power, in short, was that not unfitly named 'revivalist'; what men already held as an intellectual belief, he made them hold as a living, working reality. *The Works of the Rev. J. W.* were collected and published in 16 vols., 1809, 3d ed. 14 vols. 1829–31. See Southey's *Life of W. and Rise and Progress of Methodism* (2 vols 1820; new ed. Bohn, 1864) and Miss Wedgwood's *Life of W.* (1 vol. Lond. 1870), and Tyerman's *Life and Times of W.* (Lond. 1870, 3d ed. 1876).

Wesley'an Conference. See METHODISTS.

Wesley'an University, The, opened at Middletown, Connecticut, U.S., in 1833, occupies the former buildings of the American Literary, Scientific, and Military Academy, which with recent additions comprise a library of 20,000 volumes, a chapel erected as a memorial of the eighteen students and alumni who fell in the Civil War, laboratories, the Orange Judd hall of natural science, &c. There are three courses: Classical, Latin-Scientific, and Scientific. Since 1872, ladies have been admitted to the W. U., which in 1876 had 16 professors and instructors, and 176 students (9 ladies).

Wessel, Johann, called **Gansfort**, one of the 'Reformers before the Reformation,' was born about 1420 at Groningen, studied Greek and Hebrew and the Platonic philosophy at Koln, taught philosophy there and elsewhere, and died 4th October 1489 at his native town. W. was named by his admirers *Lux mundi*, by his adversaries *Magister contradictionum*. He was a man of a powerful intellect, an eager opponent of the scholastic philosophy, and (for his time) a bold and original speculator. After his death a great part of his writings were condemned by the Church. Luther edited a part of his works under the title of *Farrago Rerum Theologicarum* (Wittenb. 1522). A complete edition was edited by Joh. Lydius (Amsterd. 1617). See his Life by Ullmann (Hamb. 1834), Bahring (Bielef. 1846), and Friedrich (Regensb. 1862).

Wessex. See HEPTARCHY.

West, Benjamin, an Anglo-American painter, was born of a Quaker family at Springfield, Pennsylvania, 10th October 1738. He showed great precocity in the use of water-colours and at the age of sixteen practised portrait-painting around Philadelphia. After painting for some time in New York, he went in 1760 to Italy, where he studied till 1763, when he settled in London. He soon acquired a high reputation for his portraits, and was introduced to King George III., whose patronage he enjoyed for forty years. On the death of Dr. Johnson in 1791 he was elected President of the Royal Academy, and occupied the chair, with a short interval, till his death, which took place in London, 11th March 1820. He was buried with great pomp in St. Paul's. W. is criticised somewhat harshly by Dr. Waagen, who considers that he valued nature less than academic rule, while admitting the superior quality of his drawing, composition, and chiaroscuro. Among his principal works are the 'Death of Wolfe,' 'Battle of the Boyne,' 'Battle of La Hogue,' 'Christ Before Pilate,' 'Orestes and Pylades,' 'Christ Healing the Sick,' 'The Last Supper,' 'Death on the Pale Horse,' 'Moses Delivering the Laws,' 'Alexander the Great with his Physician,' 'Agrippina with the Ashes of Germanicus,' and 'Cromwell Dismissing the Symbols of Royalty.' W. also painted several pieces for the court chapel at Windsor, and designs for the windows executed by Forest in 1792–96, as well as several pieces for the castle. See Galt's *Life and Studies of B. W.* (Lond. 1820), and Waagen's *Treasures of Art in Great Britain* (3 vols. Lond. 1854).

West Brom'wich, one of 'the Black Country' towns in S. Staffordshire, England, on a barren heath 5 miles N.W. of Birmingham by rail. It is the centre of a productive mining district, and has important mineral industries, manufacturing engine-boilers, boiler-plates, ship-tanks, anvils, anchors, gasometers, gas-pipes, lamp-posts, railings, locks, coach furniture, &c. There are large smelting furnaces, foundries, malt and lime kilns, chemical works, brick-yards, &c. The town is of recent and rapid growth, and has several handsome edifices. The public buildings (erected in 1875 at a cost of £30,000) comprise a town-hall with a fine organ (1878) and a massive tower 130 feet high, a market-hall (151 feet by 90), free library, public baths, &c. Besides 11 Established churches, there are numerous Dissenting chapels; the parish church was restored (1876) at a cost of £3000, and a second Roman Catholic church was erected in 1877. Pop. (1871) 47,981.

West'bury, a town of Wiltshire, England, 26 miles N.W. of Salisbury by rail. The fine church of All Saints, with a hand-

some tower, dates from the 13th c., and is a good specimen of the Perpendicular style. Woollen cloth is manufactured, but agriculture forms the main industry. More recently, discoveries of ironstone in the vicinity have led to the development of the iron trade. Pop. (1871) 6396. W. is a place of great antiquity, and Roman remains have been found in the district. Bratton Castle in the neighbourhood occupies, it is supposed, the site of a British encampment.

West'cott, Brooke Foss, D.D., born near Birmingham in January 1825, obtained a scholarship at Trinity College, Cambridge, and having gained many university distinctions graduated B.A. (1848) as twenty-third wrangler and bracketed senior classic. Elected a fellow of Trinity in 1849, he next year took orders, and was an under-master at Harrow from 1852 to 1869, when he received a Peterborough Canonry. In 1870 he became Regius Professor of Divinity at Cambridge, in 1875 an honorary chaplain to the Queen, and in 1879 a chaplain in ordinary, being besides a member of the Revision Company. W. is author of a *History of the Canon of the New Testament* (1855; 4th ed. 1875), *Introduction to the Study of the Gospels* (1860; 5th ed. 1875), *General View of the History of the English Bible* (1869; 2d ed. 1872), *On the Religious Office of the Universities* (1873), &c.

West'ern Austra'lia, a British colony embracing the whole of the Australian continent W. of 129° E. long., and lying between 13° 44'–35° S. lat. It is the largest of the Australian colonies, having an extreme length from N. to S. of 1280 miles, and an average breadth of 650 miles, with an area of 1,057,250 sq. miles, or more than eight times that of the United Kingdom. Its coast-line exceeds 2000 miles in length, and is indented by several large bays while the northern portion is fringed by numerous islands and coral reefs. The country is usually level or undulating, and the mountain-ranges are few, scattered, and of low elevation, the chief being the Darling Range (q. v.), in the S.W., whose maximum height is 3500 feet. For a distance of 200 miles inland the country is usually covered with wood, varying from scrub to forests of magnificent trees, of which the Jarrah (q. v.) is the most noteworthy. E. of this region the ground is usually sandy or stony, bare and desert in the extreme, at most supporting only stunted scrub or scanty spinifex, and here and there studded with shallow salt lagoons. The rivers of W. A. are of small size, and few of them are permanent. The chief are the Swan (q. v.), Blackwood, Murchison, Gascoyne, and Fortescue. The climate of the extra-tropical portion of the colony is exceedingly salubrious, and the extremes of drought and flood common in the other Australian colonies are unknown in W. A. Severe N.W. gales and occasional hot winds from the interior are the chief drawbacks to the climate. The settled portion, which occupies the S.W. part of the colony, and measures about 600 by 150 miles, contains many fertile tracts, on which all European fruits grow to perfection, and fine wheat is also produced. In 1877 the yield of wheat was 251,174 bushels, of barley 77,324, of oats 18,060. Much of the colony is well adapted for grazing, and although the presence of poisonous plants somewhat hinders stock-raising, W. A. in 1877 had 30,691 horses, 52,057 cattle, 797,156 sheep, and 18,942 pigs. Gold, believed to exist in abundance, is worked to a small extent; the rich deposits of lead and copper are being remuneratively wrought; and zinc, iron, and coal are also plentiful. A flourishing pearl-shell fishery is carried on along the coast, chiefly by Malay labour. In 1877 the total value of the imports of W. A. was £362,707, and of the exports £373,352, the chief items of the latter being wool, timber, pearl-shell, tortoise-shell, sandalwood, gums, guano, and horses. At the close of 1877 there were 68 miles of railway open, and 25 more in course of construction, and 1567 miles of telegraph were in operation. The pop., exclusive of aborigines, was officially estimated at 27,838, and the public debt amounted to £161,000.

W. A. was taken possession of by a British military detachment in 1826, and three years later the first settlement was made on the Swan River, whence the country was for years known as the Swan River Settlement. At the request of the colonists the transportation of convicts to W. A. was commenced in 1850, and continued until 1868, when the representations of the other Australian colonies caused it to be stopped. The government is administered by a Governor appointed by the Crown, and assisted by an Executive Council of 5 members, as well as by a Legislative Council of 21 members, of whom 7 are nominated by the Crown, and the remainder elected by the constituencies. The capital is Perth (q. v.), and the other principal settlements are Freemantle, Geraldton, Albany, and King George's Sound (q. v.).

West'field, a town of Massachusetts, U.S., 9 miles W. of Springfield by rail. It has 9 churches, a public library, and 1 weekly newspaper. The waterworks of W. are very large. W. has great whip-factories, turning out annually £160,000 worth of whips, extensive cigar-manufactures—18,046,000 cigars having been made in 1875—paper-mills, &c. It is also noted for its manufacture of church-organs and piano-legs. In 1876 the valuation of W. amounted to $7,544,369. Pop. (1876) 6242.

West Indies, a name given to that archipelago which stretches from the channel of Yucatan (q. v.) to the Gulf of Maracaybo (q. v.). The name arose out of the belief of Columbus that, by his voyage across the Atlantic, he had reached by a westward route the famous and reputedly opulent empire of India. See ANTILLES, and the articles devoted to the various islands of the group.

West'macott, Sir Richard, R.A., an English sculptor, was born in London, July 1755, and in 1773 went to Rome, where he became a favourite pupil of Canova, and gained a gold medal for the best piece of statuary. He also obtained a prize for sculpture at Florence, and was elected a member of the academy there. On his return to England (1798) he rapidly obtained a high reputation, which was confirmed by the statue of Addison (1806) in Westminster Abbey. W. became an R.A. in 1816, succeeded Flaxman as professor of sculpture at the Royal Academy in 1827, and was knighted in 1837. He died 1st September 1856. Among his chief statues, most of which are in Westminster or St. Paul's, are those of Sir Ralph Abercromby, Lord Collingwood, Pitt, Fox, Erskine, Nelson, Warren Hastings, George Canning (in St. Margaret's Church), George III. (on Snow Hill), and Lord W. Bentinck (in Calcutta). Other works are the Achilles in Hyde Park, erected in honour of Wellington by the ladies of England at a cost of £10,000; Cupid and Psyche; the groups on the Marble Arch and in the British Museum; the large Waterloo Vase in the National Gallery. W.'s art is 'classical' or conventional, but what it lacks in originality of design is in part at least atoned for by delicacy of finish, harmony of composition, and by truth and vigour of anatomy.—**Richard W., R.A., F.R.A., R.S.**, son of the preceding, was born in London 1799, studied in Italy 1820–26, was elected R.A. in 1849, and succeeded his father as professor of sculpture in 1857. Among his best works, which are chiefly mythological and religious, are 'Venus and Ascanius,' 'The Cymbal-Player,' 'A Girl and Fawn,' 'Venus Instructing Cupid,' 'Paolo and Francesco,' the bas-reliefs 'The Blue Bell,' 'Go and Sin no More,' 'The Angel Watching,' and monumental figures of Archbishop Howley and the Earl of Hardwick. Besides *Lectures*, and the article on Sculpture for the *Encyclopædia Britannica* (8th ed. 1857), he published a treatise *On Colouring Statues*, and a *Handbook of Sculpture, Ancient and Modern* (Edin. 1864). He died at Kensington, 19th April 1872.

West'meath, a midland county of the province of Leinster, Ireland, is bounded N. by Cavan, N.E. and E. by Meath, S. by King's County, W. by Roscommon, and N.W. by Longford. Area, 453,468 acres; pop. (1851) 107,510, (1871) 78,432, a decrease due to emigration. With a gently-undulating surface, nowhere exceeding 710 feet of elevation, W. forms part of the central Carboniferous limestone district. The water-area of 22,427 acres belongs chiefly to the basin of the navigable Shannon (q. v.), which, widening into Lough Ree, forms the western boundary; but on the E. rise numerous small tributaries of the Boyne. The soil, in the E. a heavy loam, becomes lighter to the W., and the climate is equable, the rainfall of 1877 being 45·51. Of 93,409 acres under crops in 1878 (127,214 in 1853), 125 were in wheat, 22,941 in oats, 828 in barley, bere, and rye, 11,146 in potatoes, 5698 in turnips, and 49,296 in meadow and clover, while woods and plantations covered 8229 acres in 1877. The live-stock included (1878) 12,463 horses and mules, 4266 asses, 98,160 cattle, 149,775 sheep, and 15,215 pigs, and the rateable valuation was £315,544. The population is almost wholly agricultural and Catholic, there being in 1871 but 6667 Protestants; and of the total 31 per cent. were illiterate, though W. had 177 schools. Athlone (q. v.) and Mullingar (q. v.) are the only towns in the county, which returns two members to Parliament. Anciently it formed part of the kingdom of Meath (q. v.), from which it was separated in 1543.

West'minster, The City of, an important section of the metropolis of the United Kingdom, is bounded on the E. by the city of London and on the S. by the river Thames. From Tottenham Court and by Finsbury Road westwards to Kensington Gardens it is separated from the parliamentary borough of Marylebone by Oxford Street, while its western boundary is a line crossing the centre of the Serpentine in Hyde Park and reaching the river at Chelsea Hospital. In 1871 it contained 26,400 inhabited houses, and a pop. of 253,985 souls. It returns two members to Parliament. Historically and architecturally it is full of an interest which culminates in the venerable pile known as Westminster Abbey, around which the city itself sprung. The foundation of the first Abbey on a spot formerly surrounded by the waters of the Thames, and called Thorney Island, is involved in mystery, but here was certainly one of the earliest Christian churches in England. Sebert, King of the East Saxons, who died in 616, is believed to have completed a sacred edifice dedicated to St. Peter, which was destroyed by the Danes. Edward the Confessor in its place built a structure of great splendour for his time, and endowed it with a charter of ample powers and privileges. Henry III. pulled down a portion and enlarged the plan of this ancient Abbey, adding a chapel dedicated to the Virgin and the 'incomparable' chapter-house. Henry VII. built the magnificent chapel to the E. of the Abbey which bears his name. After his reign the building fell into decay, until renovated by Sir Christopher Wren, who designed the upper part of the two western towers. The restoration of the chapter-house was undertaken by Sir Gilbert Scott in 1863. The Abbey is in the form of a Latin cross, its exterior length being 416 feet, or including Henry VII.'s chapel, 530 feet. Its interior length is 375 feet, and its greatest interior breadth 200 feet. The breadth of the nave and aisles is 75 feet, and their interior height, to which the abbey owes much of its stately appearance, is 101 feet. The best view of the abbey is from the W. door between the towers. In the interior are a noble range of pillars terminating towards the E. by a sort of semicircle inclosing the chapel of Edward the Confessor. The fabric is lighted by a range of windows supported by galleries of double columns on the arches of the pillars, by an upper and under range of windows, and 4 capital windows, the whole of the lights being admirably arranged. 22 windows are enriched with stained glass. The new choir, 155 feet by 35 feet, was executed in 1848. The 52 stalls exhibit a great variety of carving and tracery. The reredos, completed under the direction of Sir Gilbert Scott, is an elaborate and splendid work. The names of the various chapels, beginning from the S. cross and passing round to the N. cross, are in order as follows:—(1) St. Benedict; (2) St. Edmund; (3) St. Nicholas; (4) Henry VII.; (5) St. Paul; (6) St. Edward the Confessor; (7) St. John; (8) Islip's Chapel, dedicated to St. John the Baptist; (9) St. John, St. Michael, and St. Andrew. The Chapel of Henry VII. is adorned without with 16 Gothic towers, beautifully ornamented and jutting from the Abbey at different angles. Here is the magnificent tomb of that monarch and his queen. In the S. transept is the well-known Poet's Corner. Every English sovereign since the Conquest has been crowned in Westminster Abbey, and the coronation-chairs and the coronation-stone of Scotland are in the Chapel of Edward the Confessor. 13 sovereigns (George II. being the last) and 14 queens are buried in its precincts. Here also are the remains of Chaucer, Spencer, Ben Jonson, Dryden, Cowley, Addison, Congreve, Prior, Gay, Dr. Johnson, Garrick, Sheridan, Campbell, and Macaulay; of Handel, Blow, and Purcell; of Pitt, Fox, Wilberforce, Grattan, Canning, and Peel; and a multitude of the illustrious departed. Palmerston, Charles Dickens, Lytton, and Livingstone are among the latest of the glorious company. There are also memorials to Shakespeare, Milton, Goldsmith, Thackeray, and many others whose remains lie elsewhere. Some of the monuments, such as that to John, Duke of Argyll, are very imposing. The Abbey fills a great place in the political and religious history of England. The Chapter-House was used for three centuries as the meeting-place of the House of Commons, and was thus the cradle of representative government, and the scene of the chief acts which laid the foundation of the civil and religious liberty of England. The Westminster Assembly of Divines sanctioned in the Abbey the Confession of Faith, which is the recognised creed of the Presbyterian Church (1643-52), and the final alterations on the Book of Common Prayer were made by the Bishops in the Jerusalem Chamber in 1662. Roman, Anglican, and Puritan theologians have in turn preached in these walls. In recent times, under the enlightened rule of Dean Stanley, the national character of the Abbey has been well maintained. Officially called the Collegiate Church of St. Peter, it is governed by the Dean, a chapter of 8 prebendaries, and other officers. See *History and Antiquities of Abbey Church of St. Peter, Westminster*, by John Neale and Edward Brayley (2 vols. Lond. 1818), *Historical Memorials of Westminster Abbey*, by Dean Stanley (4th ed., Lond. 1876), and the *Historical Description of Westminster Abbey*, printed for the Vergers (1878). Adjoining the Abbey is the ancient *Church of St. Margaret's*, dating from the reign of Edward I., where members of the House of Commons are supposed to attend officially at the beginning and end of the Parliamentary session; and *Westminster School*, which takes rank as one of the greatest of English Public Schools (q. v.). *Westminster Hospital*, which stands in Broad Sanctuary, was founded in 1715, the present building having been erected in 1834. *Westminster Hall*, attached to the Houses of Parliament, is a place of great historic interest. It was erected by Richard II., is 90 feet high and 290 feet long by 68 feet wide. Internally roofed by thirteen great ribs of timber, it has one of the largest roofs in the world unsupported by pillars. Here Wallace, Sir Thomas More, the Protector Somerset, Strafford, Charles I., and the three Jacobite lords in 1745, were condemned to death; here Cromwell was inaugurated Lord Protector; and it is the scene of the famous trials of the seven bishops and of Warren Hastings. At the coronation of George IV. a grand coronation banquet was given within its walls. The higher law-courts of England, which have met here so long, are about to be transferred to new courts in the Strand. The old *Houses of Parliament* were destroyed by fire in 1834, and the present magnificent Gothic edifice, facing the river Thames and forming the most splendid legislative building in the world, was built from the designs of Sir Charles Barry. 900 feet long by 300 wide, it covers 8 acres, has 100 staircases, 1100 apartments, and 2 miles of corridors, whilst it is warmed by 16 miles of steam-pipes. The original cost of the building was £2,000,000, but this sum has been doubled by improvements and embellishments. It is built of Yorkshire limestone, which shows an unfortunate tendency to decay, to remedy which various plans have from time to time been tried. The river terrace is of Aberdeen granite, and the river frontage is decorated with rows of statues and shields of arms of the Kings and Queens of England. The proposed land frontage, with a façade to enclose the law-courts, has not yet been completed. The central tower is 300 feet high; the splendid Victoria tower to the S.W. (completed in 1857), where the Acts of Parliament are stored, is 346 feet high; and the clock tower to the N. surmounted by the belfry is 320 feet high. The clock has four faces, each 22 feet in diameter; the bell weighs 9 tons. At the Westminster Bridge end are the apartments of the Speaker and the Serjeant-at-Arms; at the other end those of the Usher of the Black Rod and the Lords' Librarian. Above these are long ranges of rooms for parliamentary committees. The Houses of Lords and Commons, in the centre of the building, are separated by corridors and the great octagon hall. The House of Peers (97 feet long, 45 feet wide, and 45 feet high) is one of the most magnificent chambers in the world. The House of Commons is cramped for room, being only 62 feet long, its other dimensions being the same as the House of Peers. The Royal entrance is under the Victoria tower, leading to the Robing Room and the Royal Gallery adjoining the House of Peers. There are a number of spacious and beautiful halls and courts devoted to various purposes, and adorned by many splendid paintings, statues, and frescoes. The public are admitted to the Houses of Parliament on Saturdays by tickets obtained on the spot. *Westminster Bridge* (built 1856-62) has a very graceful appearance. It stands on seven arches of iron, is 1160 feet long and 85 feet wide. The *Victoria Embankment* (finished in 1870), from the Bridge to Blackfriars, is one of the greatest modern improvements in the C. of W. The magnificent *Public Offices* in Whitehall, accommodating the Foreign, India, Colonial, and Home Offices, were designed by Sir Gilbert Scott.

West'moreland, one of the northern counties of England, is bounded on the W. and N.W. by Cumberland, on the S.W. and S. by Lancashire, on the S. and E.N.E. by Yorkshire, and

on the N.E. by Durham. Area, 500,906 acres, of which in 1878 16,043 were under oats, 2370 under barley, and 1088 under wheat, in all 19,688 under corn crops, as against 10,317 under green crops (7861 under turnip and 1779 under potatoes), 15,892 under grasses, and 196,185 of permanent pasture. In the same year the number of horses returned was 8158, of cattle 61,586, of sheep 348,174, and of pigs 8158. The country is mostly mountainous, being traversed in a general direction from N. to S. by various ridges belonging to the Pennine and Cumbrian chains, the two being divided by the valley of the Eden, which, with the Lune, the Kent, the Winster, and the Rothay, conveys the drainage of the country into the Morecambe Bay. Geologically W. is divisible into three districts—the N.W., whose prevailing formation is green slate and porphyry; the S.E., characterised by upper slates of the Silurian system, and the N.E., including the basin of the Eden, where Carboniferous rocks occur, and in the neighbourhood of Dufton and Orton lead and copper mines, 1372 tons of lead being extracted in 1874 from the five lead mines at Dufton. Three collieries also yielded 1791 tons in 1878. W., however, owes its chief celebrity to its mountains and lakes, though Helvellyn and Windermere belong partly the one to Cumberland and the other to Lancashire, but Crossfell, Bowfell, High Strut, Birbeckfell, Ulleswater, Grasmere, Rydal, &c., are well known to the tourist. The climate is moist, Kendal having the reputation of being the rainiest town in England, and the snow-storms in winter have more than once proved fatal to unwary mountaineers. The soil in the valleys is mostly a deep gravelly mould, very favourable to the growth of turnips, but towards the E. and N. it inclines more to clay. The chief towns are Appleby, Ambleside, Kendal, and Brough. W. returns three members to Parliament. This county seems to have played a part of some little importance in Roman and Old English times, to judge from the remains which have been discovered at Brough and elsewhere, but in the more historic centuries it does not come prominently forward. The lake district is indissolubly associated with the poet Wordsworth, on the relation of whose poems to the scenery of the district see Professor Knight's *English Lake District as interpreted in the Poems of Wordsworth* (Edin. 1879). Compare also J. Lawson on the *Geography of W.* (Lond. 1878).

Westpha'lia (Ger. *Westfalen*), a province of Prussia, bounded N. by Holland and the province of Hannover, E. by Hannover, Schaumburg-Lippe, Braunschweig, Waldeck, and Hessen-Nassau, S. by Hessen Nassau and the Rhine Province, and W. by Holland and the Rhine Province. Area 7799 miles; pop. (1875) 1,905,697 (806,464 Protestants, 949,118 Catholics, 17,245 Jews). It is divided into three districts—Münster in the N.W., Minden in the N.E., and Arnsberg in the S. The northern half is generally flat, the southern covered with ranges of hills of no great elevation, offshoots from the Harz Mountains. The chief ranges are the Weser chain, the Teutoburgerwald, which forms the watershed between the Rhine and the Lippe, and the Suntelgebirge, extending from Osnaburg into Schaumburg-Lippe, crossed 5 miles S. of Minden by the famous pass, the *Porta Westphalica.* The chief rivers are the Weser, with the Diemel and Werre, the Ems, Lippe, and Ruhr. The soil in the N. is sandy, with extensive tracts of heath and swamp, in the S. is more fertile. About 41·6 of the surface is under cultivation, 27·9 under wood, and 17·3 under pasture. The chief crops are corn, buckwheat, potatoes, leguminous fruits, flax, hemp, hops, and tobacco. In 1873 there were within W. 118,073 horses, 567,975 cattle, 484,151 sheep, 251,840 pigs, 171,243 goats, and 95,668 hives of bees. W. is rich in minerals. In 1875 the yield was, coal, 214,980,503 cwts.; iron ores, 15,984,597 cwts.; zinc ores, 630,487 cwts.; copper ores, 787,636 cwts., and of lead ores, quicksilver, antimony, and pyrites, 2,361,051 cwts. Active manufactures are carried on of cottons, linen, paper, glass, leather, cordage, sail-cloth, powder, potash, sugar, soap, pottery, cigars, and wooden wares. The chief articles of export are linens, cottons, coal, iron, timber, sausages, and the well-known Westphalian hams. See Freiligrath and Schücking, *Das Malerische und Romantische W.* (2d ed. Paderborn 1871). The name *W.* formerly signified the district in the N.W. of Germany between the Weser, the Rhine, and the Ems; while the name *Ostphalia* was applied to the tract between the Weser and the Elbe. Both districts were included under the name Sauerland, and formed a part of the great duchy of Sachsen, of which a portion belonged to the archbishops of Köln. This formed the duchy of W., which lasted from 1179 to 1802, when the duchy was joined to Hessen-Darmstadt, and in 1815 to Prussia, forming, with the addition of several small principalities, the present province of W.

Westpha'lia, a kingdom formed by Napoleon in 1807 for his brother Jerome, consisting of the territories of Braunschweig-Wolfenbüttel and Hessen-Kassel, the Prussian provinces of Magdeburg and the Old Mark on the left bank of the Elbe, with parts of the present provinces of W. and of Hannover. Its area was 14,500 sq. miles, and its pop. 1,947,000. After the disaster at Leipzig in 1813, Jerome was compelled to fly from his kingdom, and by the Treaty of Vienna his dominions were given back to the different possessors from whom they had been torn. See *Le Royaume de Westphalie; Jérôme Buonaparte, Sa Cour ses Favoris et ses Ministres. Par un Témoin Oculaire* (Par. 1820).

Westpha'lia, Treaty of. See THIRTY YEARS' WAR.

West Point, a military post, and the seat of the United States Military Academy, on the W. bank of the Hudson, between the towns of Highlands and Cornwall, 52 miles N. of New York. In the midst of the romantic 'Highlands of the Hudson,' the Academy stands on a plateau 160 feet above the river, flanked towards the river by rocky heights. In the angle of the river opposite the Point is Constitution Island, a rocky mass rising to a height of 130 feet. The Academy was founded in 1802 for 56 cadet artillerists and engineers, a number increased to 250 in 1812. It is governed by 41 professors and teachers, under a board of visitors. Since 1861 the course of study has been fixed at four years, and while largely mathematical and professional, it includes among other subjects French and Spanish, drawing, chemistry, geology and mineralogy, mechanics, optics, astronomy, and military and international law. In the nomination of cadets, sons of soldiers who have been killed in battle have a preference, and each member of Congress has the right to nominate 1 cadet from his district, while the President can nominate 10. From 1802 to 1864 the number of graduates was 2592, and the total sum expended on the Academy amounted to $7,133,235. Near the Academy is Camp Town, comprising soldiers' barracks, storehouses, &c. In the Revolution War the British strove to gain control of the Hudson, which formed an important line of communication from New York to Canada. The Americans strongly fortified the Highlands, through which the river flows for several miles, and the centre of their position was W. P. The British took Forts Montgomery and Clinton in 1777, but abandoned them on the surrender of Burgoyne's army. The forts were reconstructed and augmented by Radière and the Polish hero, Kosciusko, some $3,000,000 being expended on them in two years. Washington took up his headquarters here in 1779, and in the following year Arnold received the command, and made the treasonable attempt to surrender his charge, which was foiled by the capture of Major André (q. v.). Fort Clinton has been partly restored, but the others are in ruins. See Boynton's *History of W. P.* (New York 1863).

West'port, a seaport town of county Mayo, Ireland, on Clew Bay, 11 miles W.S.W. of Castlebar by rail. It was planned and largely built by the Marquis of Sligo, and has Anglican, Roman-Catholic, Presbyterian, and Methodist churches. It has also a court-house and a convent. The linen trade, once important, is now nearly extinct, but a large export trade in provisions, &c., is carried on. In 1878, 139 ships of 19,924 tons entered, and 147 of 19,863 tons cleared this port; and 605 fishing-boats, employing upwards of 3000 men, were registered here. W. is now a favourite sea-bathing resort. Pop. (1871) 4417.

West Prussia. See PRUSSIA.

West Troy, a suburb of the city of Troy (q. v.), U.S., lies on the right bank of the Hudson, which is here crossed by an iron bridge, and at the entrance of the Erie and Champlain Canals. The town is well laid out on a gentle slope, and contains several fine buildings, including a public market erected in 1876. It has not yet obtained a charter, though much the largest village in New York State. The trade is chiefly in lumber, though some cloth and hardware goods are also manufactured. Adjoining W. T. is the Waterolict United States Arsenal. Pop. (1870) 10,693.

Wet'stein, Johann Jakob, born at Basel, 5th March 1693, after studying theology was for some time chaplain to a

Swiss regiment in the service of Holland, and in 1717 became dean of his native town. Deprived of his post in 1730 on a charge of Socinianism, he three years later accepted a call to the chair of ecclesiastical history at Amsterdam, where he died 23d March 1754. His critical edition of the New Testament (2 vols. Leyd. 1751–52), for which W. collated many important MSS., is furnished with exegetical notes from Jewish, Greek, and Latin writers, and still retains its value. The *Prolegomena*, previously published in a separate form (Amst. 1730), were re-edited by Semler (Halle 1764).

Wett'e. See DE WETTE.

Wett'er, Lake, in S. Sweden, surrounded by the läns of Östergötland, Nerike, Vestergötland, and Smaland. It is 125 miles long, 31 miles broad, and 410 feet deep, and lies on a shelf of the Swedish mountain system, so that it is fed by no considerable stream. It is conjectured that its cold, clear, blue waters are drawn from hidden springs. It is remarkable for its *mirages*, its periodic rise and fall, and the sudden commotions of its surface that often take place amid a general calm. Through the middle of the lake runs lengthwise a shallow, from which islands rise here and there. Lake W. has its outlet near the middle of its E. coast by the Motala, and is connected with the Skagerak and with the Baltic by the Göta Canal.

Wett'erhorn ('peak of tempests'), one of the most striking peaks of the Bernese Oberland, has three summits—the W., called by the natives Hasli-Jungfrau, 12,147 feet high; the middle, known as the Mittelhorn, 12,165 feet; and the E., the Rosenhorn, 12,110 feet. These were ascended first in 1844 and frequently since, the ascent being made from Grindelwald, and the previous night spent at a club-hut built among the rocks at the foot of the main peak. The contrast between the bright fresh pastures and the black precipices and dazzling snow-ridges of the W. is particularly striking, making the valley of the Reichenbach a favourite resort of artists.

Wetz'lar, a town of Rhenish Prussia, on the Lahn, 95 miles S.E. of Köln by rail. It has a cathedral, built at intervals during the 13th, 14th, and 15th centuries, and still unfinished. Protestants worship in the choir, Catholics in the nave. There are also a gymnasium and a synagogue, and glove-factories, spinning, iron-works, phosphorus-works, &c. Pop. (1875) 6837. W. is a scene in Goethe's *Werther*. It first appears in history during the 12th c. The Diet of Spires met here from 1689 to 1808. See Wigand's *W.* (Wetz. 1862).

Wex'ford, a maritime county in the province of Leinster, Ireland, is bounded N. by Wicklow, E. by St. George's Channel, S. by the Atlantic, and W. by Waterford, Kilkenny, and Carlow. Area, 572,920 acres; pop. (1851) 180,159, (1871) 132,666, a decrease due to the emigration of 54,021 persons during 1851–77. With a dangerous coast-line, W. is tolerably level, its central district being only broken by such isolated summits as Carrickbyrne (767 feet), but on the northern frontier are Blackstairs Mountain (2409 feet) and the Mount Leinster Ridge (2610 feet). Bounded W. by the Barrow, it is traversed by the Slaney and its affluent the Bann, but the entire water area of the county is only 3668 acres. Clay-slate is the prevailing formation, and the climate is mild, the rainfall of 1877 varying at different points from 42·39 to 65·47. Of 216,590 acres under crops in 1878 (247,510 in 1853), 7816 were in wheat, 44,004 in oats, 52,081 in barley, bere, and rye, 22,853 in potatoes, 18,210 in turnips, and 61,696 in meadow and clover, while woods and plantations covered 9765 acres in 1877. The live-stock included 28,725 horses and mules, 8156 asses, 115,921 cattle, 159,850 sheep, and 73,605 pigs in 1878, when the rateable valuation was £375,259. The population is mainly agricultural and Catholic, there being only 12,310 Protestants in 1871; and of the total, 31·7 were illiterate, though W. had 264 schools. Wexford, New Ross, Enniscorthy, and Gorey are the chief towns of the county, which returns two members to Parliament. The territory of Ptolemy's *Menapii*, W. was first harried then colonised by Danes, formed the starting-point of the English conquest (1169), was terribly subjugated by Cromwell (1649), and became the chief seat of the Irish rebellion of 1798, 15,000 United Irishmen mustering in the camp on Vinegar Hill, near Enniscorthy. Antiquities abound throughout the county, from Celtic *raths* to ruined castles and monasteries of mediæval times.

Wex'ford, the capital of the county of the same name, and a parliamentary borough, 74 miles S. of Dublin by rail, at the mouth of the river Slaney, which here expands to form a harbour 6 miles long. It contains three Roman Catholic churches, two Episcopal, one of which, St. Selsker, dates from about 1200, and meeting-houses belonging to minor sects, St. Peter's College, a preparatory school for Maynooth, a diocesan Protestant school, and various others. The trade is chiefly retail, but corn, poultry, and oysters are shipped to Liverpool, with which there is regular steamboat communication. The harbour is finely situated, but a bar at its mouth prevents the entrance of any but small vessels. In 1878 there entered 852 vessels of 80,892 tons, and cleared 812 of 79,110 tons, the imports amounting (1877) to £21,654, and the customs to £6441. The borough returns one member to Parliament, and supports four newspapers. Pop. (1871) 12,077, of whom 11,196 were Roman Catholics.

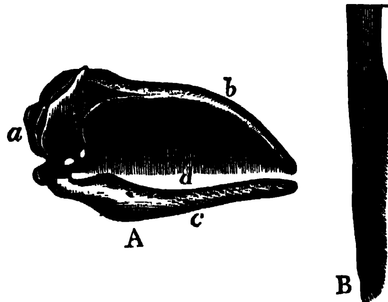
Wey'er, Sylvain van de, a Belgian statesman, born in 1802 at Louvain, studied law there, and subsequently practised at the bar in Brussels till appointed city librarian, keeper of the Burgundian archives, and professor at the museum. These appointments he lost in consequence of his becoming leader of the opposition and co-editor of the *Courrier des Pays-Bas*. After the Revolution of 1830 he was a member of the Committee of Public Safety, and of the Provisional Government, and in the National Congress was a zealous advocate of the exclusion of the House of Orange. In November 1830 he was commissioned to confer with the English cabinet, and on his return he became President of the Diplomatic Committee and Minister of Foreign Affairs (February 26, 1831). On the accession of Prince Leopold, W. was appointed ambassador to England. Recalled in 1845 to form a new cabinet, he failed as Minister of the Interior to reconcile the Liberal and Catholic parties, and in 1846 returned to his former post in London, which he held till his resignation in 1867. He died in London, May 23, 1874. His literary works are published under the title *Choix d'Opuscules Philosophiques* (5 vols. Lond. 1863 *et seq.*). See Juste, *Les Fondateurs de la Monarchie Belge* (vols. x. and xi., Brus. 1871).

Wey'mouth, a township of Massachusetts, U.S., 11 miles S. of Boston by rail, has 6 printing-offices, a sanatorium, 1 newspaper, and manufactures of boots, iron, drugs, &c. Pop. (1870) 9010. Founded in 1626, W. is the second oldest settlement in the State.

Wey'mouth and Mel'combe Re'gis, a seaport and watering-place of Dorsetshire, England, 8 miles S. of Dorchester by rail, stands on a curving bay, which is bounded W. by the Isle of Portland (q. v.), and E. by St. Alban's Head. The Wey, after widening into a 'back-water,' here enters the sea, and Weymouth, an old-fashioned fishing-town, stands on its right, on its left bank Melcombe Regis, with handsome terraces and a fine esplanade, at the W. end of which is a pile pier erected in 1859 at a cost of £12,000. There are four churches, Holy Trinity (1836), St. Mary's, St. John's (1854–68), and Christ Church (1874), and other buildings are the guildhall, market-house, assembly-rooms, baths, masonic hall (1816), middle-school (1860), collegiate school recently built, hospital, and dispensary opened in May 1872, eye infirmary which was opened for the reception of patients in May 1872, and the sanatorium (1862). The bay is commanded by the Nothe Fort, W. of the harbour. This fort has fifteen of the heaviest guns in use, bomb-proof magazines for shot and shell, and barrack-rooms for a garrison of 800 men. In 1878 there entered 925 vessels of 107,921 tons, and cleared 942 of 102,578 tons; and on 31st December 41 vessels of 4074 tons upon the register of the port, including a line of mail steamers to the Channel Islands. In the same year the Great Western Railway opened a traffic between this port and Cherbourg, and steamers ply to and fro daily, Sundays excepted, to Portland. In 1877 the exports (Portland stone and agricultural produce) amounted to £158,277; the imports (wine, spirits, coal, and timber) to £126,246; and the customs to £10,195. To summer visitors, however, Weymouth mainly owes its prosperity, which dates from the visits of the royal family towards the close of last century. It publishes three weekly newspapers (two of which are printed at Dorchester), and returns two members to Parliament. Pop. (1821) 6622, (1871) 13,259.

Whale, the name applied to the larger Mammals belonging to the order *Cetacea* (q. v.). The adaptation to an aquatic

existence of necessity involves a departure to some extent from the ordinary Mammalian type of structure, and in the true whales, as typically exemplifying this group, the chief points of difference may be conveniently studied. Externally, the immense bulk of the *Cetacea* attracts attention, as also does the essentially fish-like shape of the body. The regions of the body are indistinctly marked, no true neck being discernible, and the enormous head being apparently united directly to the trunk. Posteriorly, a transverse or horizontally-placed caudal-fin terminates the body. This fin is merely an expansion of the integument, strengthened by a cartilaginous framework. A median 'dorsal-fin' is also sometimes found. Anterior limbs exist in the form of swimming-paddles, but posterior limbs are undeveloped throughout the order.



CETACEA.

A. Skull of Whalebone Whale (*Balæna mysticetus*). *a*, Cranial portion of skull; *b*, upper jaw; *c*, lower jaw; *d*, baleen.
B. Single plate of baleen, showing the fibrous edge by which the plates are united together.

The facial bones are large and extended as compared with the cranial portion of the skull (Fig. A, *a*); and in the Whalebone Whales (*Balænidæ*) the upper maxillary or jaw bones (*b*) bear deep ridges, in which the plates of 'whalebone' or 'baleen' (*d*) are inserted. These plates, which are flattened, and of elongated shape, are so attached to the palate that the long axis of each depends into the cavity of the mouth; the entire series of plates thus forming as it were a double median fringe to the upper jaw (*b*). The outer or free edge of each plate is fringed in turn by a fibrous arrangement of the whalebone (Fig. B), binding the entire structure more closely together, and so tending to render it more effective in its purpose, which is undoubtedly that of acting as a 'sieve' or 'strainer;' preventing substances of large bulk from passing into the contracted œsophagus of the animal, and at the same time serving to retain and entangle the minute organisms upon which these creatures principally subsist. The food of the W., therefore, consists principally of *Pteropodous* Mollusca, which exist in countless shoals in the Arctic Seas; and certain members of which, from the foregoing circumstance, have received the collective title of 'whale's food.'

The chief points of interest in the skeleton of the *Cetacea* are comprised under the consideration of the modifications of the vertebral column and pelvic extremities. The cervical segments of the spine, in the present instance, are generally anchylosed together, whilst the dorso-lumbar vertebræ are exceedingly mobile, to admit of the extensive movements of the tail in locomotion. There is no true sacrum, one of the vertebral segments being by some authorities regarded as representing this bone. The skeleton of the anterior members is entirely homologous with that of other and higher *Mammalia;* the clavicles, however, being wanting throughout the order. The bones of the forearm are more or less firmly united to each other, and the entire limb is contained and hidden within the thick integument or skin, and is thus converted into an effective swimming-paddle. Posterior limbs are wanting in Cetaceans, only a few species (*e.g.*, the whalebone whales) having a rudimentary femur, while the haunch-bones or *pelvis* are represented by two small bones imbedded among the muscles of the abdomen. The posterior ribs are not attached to the breast-bones, but simply spring from the spine above. The teeth of whales are as a rule conical in shape, and are present in all whales save the *Balænidæ* or whalebone W., although teeth are represented in the fœtal state of the animal. The stomach of whales appears to tend towards a compound type of structure, and in some respects resembles that of the *Ruminantia* (q. v.). The breathing apparatus presents us with several structural features worthy of notice. The nostrils are known as *blowholes* and *spiracles*, and are placed in *Balænidæ* on the top of the head. They play an important part in the respiratory process, and the soft palate embraces the conical aperture of the windpipe so as to form a continuous air-passage from the posterior nostrils to the larynx, the food passing on each side of this passage.

Respiration is thus performed independently of the peculiar mode in which the process of nutrition is carried on; the animals rising at stated intervals to the surface of the water to inhale a fresh supply of air. At such times the inspired air is ejected from the 'blow-holes.' This so-called 'spouting' is not caused (as was once supposed) by the ejection of the water taken into the mouth in the act of nutrition, but by the heated air of respiration, condensed on exposure to the cold of the atmosphere, together with such superfluous water as may have gained admittance to the nostrils from without, or such superjacent water as may be driven up in the form of spray by the violent nature of the respiratory act.

An external ear is absent, but from the relation of the internal ear to the nasal passages, it is highly probable that the latter apertures subserve, in some measure at least, the purpose of a medium for the collection and transmission of sounds to the auditory centres.

The *Cetacea* in their reproduction exemplify all the characters of the higher *Mammalia;* these creatures suckling their young for a considerable period after birth, and exhibiting for their offspring the greatest care and affection.

As regards classification, whales are divided into three families. (1) The *Balænidæ* or Whalebone Whales, distinguished by the absence of teeth, by the presence of *baleen* or *whalebone*, and by the nostrils being placed on the top of the head. Of this family the Right or Greenland W. (*Balæna mysticetus*) is the typical representative, and constitutes the chief object of pursuit for the sake of the *blubber* and *whalebone*. The former substance forms a thick coating of fat serving at once to preserve an equable temperature, and to assist in reducing the specific gravity of the animal. The Right W. and the Southern W. (*B. Australis*) form the section of this family known as the 'Smooth' Whales, and which are distinguished by the absence of a dorsal fin. In the 'Furrowed' Whales, forming the second section of this family, there is a dorsal fin, and the skin is rough or furrowed, the group being sometimes known as the 'Finner' Whales. Two genera appear to be included in this section, these being known respectively as *Megaptera* and *Balænoptera*. The familiar name of Rorqual is applied to a species of this latter genus (*Balænoptera Boöps*). (2) The *Physeteridæ* or Sperm Whales, sometimes known as the *Catodontidæ*, are distinguished from the preceding family by having a large number of conical teeth in the lower jaw, those of the upper jaw being rudimentary; by the absence of 'baleen plates,' and by the great relative size of the head, at the anterior extremity of which the united nostrils are situated; this last character being essentially different from the disposition of these apertures in the *Balænidæ*. The Spermaceti W. or cachalot (*Physeter macrocephalus*), the most familiar example of the group, is hunted for the sake of the oil, spermaceti, and ambergris. The substance known as spermaceti is a peculiar fat, found principally in the cranial cavities of the animal, and much esteemed in the manufacture of unguents, and for other purposes of the pharmaceutist. The ambergris, which is found in the digestive tract, obtains its commercial repute as an ingredient in perfumes. The sperm whales inhabit the Southern Seas, and are gregarious. They swim in companies technically named 'schools,' numbering from 20 to 50 individuals. (3) The *Delphinidæ* or dolphins, including the Dolphin (q. v.), Grampus (q. v.), Porpoise (q. v.), Narwhal (q. v.). &c.

Whale'bone, the name given to the long, thin, parallel laminæ, horny in nature and bluish-black in colour, which are developed in the mouths of the family of whales called *Balænidæ*. The substance has nothing of the nature of *bone*, and is more appropriately called *baleen*. W. is valued for its strength, flexibility, compactness, and lightness. It is cleansed and softened by immersion in boiling water, and thereafter cut up into strips for making ribs of umbrellas and parasols, supports for stays and other articles of female apparel.

Softened in a steam bath, it may be moulded like horn into walking-stick and whip handles, &c. The bristles which fringe the blades are employed in brush-making, and W. shavings form a useful stuffing material. The market value of W. ranges from £200 to £400 per ton. The imports of W. or *whalefins* into the United Kingdom in 1877 amounted to 1969 cwts., valued at £82,987. The tusk of the walrus was formerly designated W., hence mediæval authors always speak of it as *white* in colour.

Whale' Fish'ery. The species of the *Cetacea* or Whale family hunted for the sake of the commercial products they afford, are the Right or Greenland whale, the Sperm whale, and other species of true Cetaceans, whilst the porpoises and their neighbours are also hunted for the sake of their oil and skin. The whaling fleet consists of a specially-organised class of vessels, sailing in Britain chiefly from Hull, Peterhead, and Dundee. New Bedford and Nantucket in the United States also send a fleet to this fishery, and the Norwegians occasionally fit out vessels for it. The ordinary whaling-vessels are now screw steamships, strongly built in view of the ice-sheets and the disastrous effects of collisions with ice-floes. The crew number from 30 to 40 men. The *harpoon* with which the whale is struck is an iron rod attaining a length of 5 feet, and possessing an arrow-shaped head. The whale, on being struck with the harpoon, dives and remains under water for about twenty minutes, the line to which the harpoon is attached being duly paid out by the harpooner. On rising the W. may be again struck, and it is subsequently pierced in a vital part with a lance or spear. The body of the animal is then made fast to the ship, and the work of *flensing* or that of stripping off the blubber begins. Thereafter the blubber is melted down into oil, and that fluid is duly stored. One ton of blubber may yield 200 gallons of oil. The whalebone is also taken out of the mouth of the animal, and is simply dried and packed. Methods of killing whales by employing harpoons charged with poison have been employed in the W. F., but the whalers appear to have some objection to use this means, though it has the advantage of killing the animal at once, and so preventing risk and obviating danger. As early as the 9th c. the Norwegians prosecuted the W. F. in Greenland; the English and Dutch first entering upon it in the 16th c. In 1680 Holland employed 260 vessels and about 14,000 men in the W. F. In 1815 England employed only 164 ships; but of late years, owing to the scarcity of whales, the W. F. has decreased rapidly, and it may be feared also permanently. America at present appears to lead the van in the matter of fishing enterprise: about 200,000 casks of oil and 150,000 casks of spermaceti being annually obtained by the American fleet.

Whales, in English law, are crown property, provided they are caught within 3 miles of the coast, or are stranded. Otherwise the animal is the property of the person who captures it; and by common consent a whale is the property of the harpooner only so long as the harpoon remains attached by line to the boat.

Whale Louse (*Cyamus ceti*), a species of *Crustacea* (q. v.) belonging to the order *Læmodipoda*, in which the first segment of the chest is united with the head, thus placing the first pair of limbs beneath the throat. In the W. L. the body is short and broad, and has seven pairs of legs, some of the feet being strongly hooked. The animal is found adhering sometimes in immense numbers to the whales, and it is said to destroy the outer cuticle or epidermis. The legs constitute the adhesive organs, and the mouth is provided with a suctorial proboscis.

Whar'ton, Philip Wharton, Duke of, son of the Whig marquis to whom is ascribed the authorship of *Lilliburlero*, was born in December 1698. Trained by his father in Whig and Presbyterian principles, he broke that father's heart by marrying at the Fleet the daughter of a Major-General Holmes (1715); next, leaving his bride, set out for Geneva with a French Huguenot for governor. Tutor and ward soon parted, the latter 'flying as from the plague' to Avignon, where the Old Pretender conferred on him the title Duke of Northumberland; and Mary of Modena lent him £2000. This squandered at Paris, he came to Ireland, and sitting a minor in the House of Lords, so ably upheld the Hanoverian government as to earn for reward a real English dukedom, 20th January 1718. His gratitude showed itself in hot resistance to the government's South Sea Bill (1721) and Bill of Pains and Penalties against Atterbury (1723), as also in his Opposition *True Briton* (74 numbers, 1723-24), started to retrieve a fortune which from £16,000 a year had dwindled to £1200 allowed by creditors' trustees. This venture failed, and in 1724 he quitted England never to return. From Vienna he wandered to Madrid, and there, letting lie unopened a Privy Council summons, he professed himself a convert to Catholicism and open adherent of the House of Stuart; there too, within a month of his first wife's death, he married an Irish maid-of-honour to the queen. At Rome the Pretender invested him with the Order of the Garter, but from Rome his excesses procured him a courteous dismissal, and 1727 found him engaging with reckless bravado in the siege of Gibraltar, thus purchasing a Spanish colonelcy by the loss at home of peerage and estates. Madness and drunkenness drove him to Paris, Orleans, and back to Spain, where a foolish quarrel embroiling him with the Madrid court, he fell into melancholy and a deep dejection. So on May 31, 1731, at a Bernardine convent in Catalonia, died he whose character Pope well sums up—'W., the scorn and wonder of our days.' The *Life and Writings of Philip, late Duke of W.* (2 vols. Lond. 1732), contains nothing beyond the *True Briton* and the eloquent speech on Atterbury's behalf, whilst in his so-called *Poetical Works* (all but a Memoir printed in 1727) some prose letters are all that can be safely attributed to his pen. Some of his effusions, however, may be found in vol. v. of Nichols' *Select Collection of Miscellaneous Poems* (8 vols. 1780-82).

Whate'ly, Richard, Archbishop of Dublin, one of the most vigorous thinkers and writers among the churchmen of the 19th c., was the son of an English clergyman, and was born at London, February 1, 1787. He studied at Oxford, became fellow of Oriel (1811), Principal of St. Albans Hall (1825), Professor of Political Economy at Oxford (1830), and Archbishop of Dublin (1831). He died at Dublin October 8, 1863. The chief writings of W. are (1), *Historical Doubts relative to Napoleon Bonaparte* (Lond. 1819), a clever parody of the Germanic sceptical criticism, which was then being applied to the Gospel narratives; (2), *Elements of Logic* (first published in 1826, a work of which numberless editions have appeared). This famous manual may be said to have revived the study of logic at Oxford. It was infinitely superior to anything that had till then appeared on the subject in the English language; and, notwithstanding the many able treatises since published, it may still be read as a clear, simple, and attractive exposition of the first principles of the science of reasoning, but it lacks thoroughness and grasp of ultimate principles. It does not show any sign of peculiar philosophical ability, and it is disfigured by errors in detail which are only excusable, when we remember that it was (in a certain sense) a work on a subject which for that generation was really a new one. (3), *Elements of Rhetoric* (1828); (4), *Thoughts on the Sabbath* (1830), a very powerfully reasoned work against the alleged binding obligation of the Mosaic Sabbath on the Christian Church; (5), *The Errors of Romanism traced to their Origin in Human Nature* (1830); (6), *Introductory Lectures on Political Economy* (1831). In addition we may mention annotated editions of parts of the writings of Archbishop King, Lord Bacon, and Paley, besides a host of sermons, charges, pamphlets, &c. W.'s position was what we should now call that of liberal orthodoxy,—orthodoxy in so far as he held firmly by the chief doctrines of the Christian faith, liberal in so far as he was disposed generally to moderate opinions. His views on the Sabbath question and his support of Jewish emancipation, and the subsidising of Maynooth, were sure marks of ecclesiastical liberalism. A great part of his writings were directed against the Tractarian party. His clear common-sense revolted strongly against their position, whilst a certain English narrowness of view, and disinclination or inaptitude to go to first principles, hindered him from perceiving the real strength of their arguments. In politics he was also a resolute liberal, and his appointment to the primacy of his Church in Ireland created much ill-will. His opinions and certain peculiarities of manner made his position for long very difficult. But he outlived dislike, and before he died there was a general recognition not only of his lucidity and strength of intellect, but of his thorough genuineness, his noble devotion to the duties of his office, and his unwearying kindness to all that sought his aid. W. was a great supporter of the Irish

National School system, and for many years was the leading member of the Board of Education. See *The Life and Correspondence of W.* by his daughter (2 vols. Lond. 1866).

Wheat (Sansk. *s'vêta*, Old Eng. *hwaete*, allied to *hwît*, 'white'—in contrast to rye, black oats, and black barley of N. Asia) is the most important of all the cereal grasses. It belongs to the genus *Triticum*, a genus in which the sessile solitary spikelets are arranged in distichous spikes, and inserted broadside to the rachis; empty glumes nearly equal; flower-glumes herbaceous, rigid; palea with ciliate nerves. There are about 25 species distributed through all temperate climates, and familiarly represented in Britain by the Couch-grass (q. v.). The W. plant is named *T. vulgare*. Its native country is not known, unless the supposition of some botanists is correct, that it has been produced by long-continued cultivation from *Œgilops ovata*, in which case it is a common plant of the Mediterranean region and neighbouring eastern countries. W. has been grown as a food-crop from the earliest historic ages, and is at the present time extensively cultivated by all civilised and semi-civilised people of temperate countries. It is grown up to 12,000 feet on the southern slopes of the Himalaya. An examination of bricks of Egyptian pyramids shows the straw and grain of W. similar to that found in Swiss lake-dwellings (*T. vulgare antiquorum* of Heer). Metzger enumerates as distinct kinds of cultivated W.:—1. *T. vulgare*, which includes numerous varieties. It comprises also the best Italian sorts for plaiting straw-bonnets and straw-hats, for which only the upper part of the stem is used, collected before the ripening of the grain, and bleached through exposure to the sun while kept moistened. 2. *T. turgidum*, comprising some varieties of White and Red W., also the Clock W. and the Revet W. 3. *T. durum*, which contains some sorts of the Bearded W. 4. *T. Polonicum*, the Polish W., some kind of which is well adapted for peeled W. 5. *T. spelta*, the Spelt corn or Dinkel W., a kind not readily subject to disease, succeeding on soil of very limited fertility, not easily attacked by birds, furnishing an excellent flour for cakes, also yielding a superior grain for peeled W. For preparing the latter it is necessary to collect the spikes while yet somewhat green, and to dry them in baking-houses. 6. *T. dicoccum*, the Emmer W. Its varieties are content with and prolific on poor soil, produce excellent starch, are most hardy in frost, and not subject to diseases. To this belongs the Arras W. of Abyssinia, where more peculiar sorts of W. are grown than in any other country. 7. *T. monococcum*, or St. Peter's corn. Is hardier than most of the other kinds, exists in the poorest soils, but produces grains less adapted for flour than for peeled W. For convenience the above may be embraced under three primary varieties of one species. 1. Var. *muticum* (*T. hybernum*, L.), the winter W. or Unbearded W.; 2. var. *aristatum* (*T. æstivum*, L.), the summer W. or Bearded W.; 3. var. *adhærens* (*T. Spelta*, L.), W. with fragile axis and adherent grain. The names red and white W. are applied according to the colour of the grain; the former are generally more hardy than the latter, but of inferior quality, and the yield is less. Winter W. is sown in autumn; summer W. in spring. The composition of W. grain shows some variations, but the following analysis may be taken as showing the proportions of the main constituents in a good sample of white English W.:—Water, 14·5; albuminoids, chiefly fibrin, 11; starch, with trace of dextrin, 69; fat, 1·2; cellulose and lignose, 2·6; mineral matter or ash, 1·7 = 100 (*Church*). These constituents are so proportioned as to render W. well fitted for the general sustenance of man, both as regards its flesh-forming and force-producing character, and it is the cheapest article of food that we possess. It is readily made into a light and spongy Bread (q. v.). Macaroni, vermicelli, and similar preparations are made from highly nitrogenous wheats. The soil best adapted to the growth of W. is a deep loam inclined to clay, with a dry subsoil. The average yield of an acre of land should be about 30 bushels (760 lbs.) of grain. A plump, rounded, white, smooth grain, without wrinkles, gives the heaviest weight per bushel. W. grain varies in specific gravity between 1·29 and 1·41, the harder samples being the denser. The proportion of grain to straw is greatest in dry years—the average is about 4 to 10. In the British Isles each person in the community is calculated to consume a little above five bushels of W. annually. The home production only supplies only about two-fifths of the requirements, all the large W.-growing countries of the world contributing the remainder. Prior to 1856 (at which date a million more acres were under W. in Britain than at the present time) the foreign imports had not exceeded 4½ million quarters; during the last five years they have averaged nearly 12½ million quarters. The yearly foreign corn trade of the country involves the movement of 6 million tons, worth more than £50,000,000 sterling. See CORN LAW.

The principal vegetable diseases to which W. is liable are of fungoid nature, and have been mentioned in articles BUNT, MILDEW, RUST, and SMUT. For those arising from the attacks of insects, see CORN MOTH, EAR COCKLES, HESSIAN FLY, WHEAT FLY, and WIREWORM.

Wheat'ear (*Saxicola œnanthe*), or **Fall'ow Chat**, an Insessorial bird belonging to the *Sylviadæ* or Warblers, and inhabiting Britain in summer. The average length is 6 inches. The male is of a light grey colour above, the wing-quills and coverts being black. The breast is buff tinged with orange, and brown tints also occur on the under parts, which are mostly white. The W. is trapped in large quantities for the table, the flesh being esteemed a delicacy when the bird is fat and well nourished. The eggs are of pale-blue colour, and number from 4 to 6. The nest is cunningly concealed in the crannies of rocks and like situations. A favourite mode of catching the W. is by means of horse-hair nooses concealed beneath a sloping piece of turf, under which the bird runs when alarmed.

Wheat Fly, the name applied to such species of insects as the *Cecidomyia tritici*, or the wheat midge, the larvæ of which feed on the wheat when in the ear and completely destroy the grain. The female W. F. lays its eggs when the wheat is in flower, and the maggots are fully developed at the end of July. The W. F. is allied to *C. destructer*, the Hessian Fly, also named the 'Wheat Midge.' The former species has transparent wings, while those of the Hessian Fly are black.

Wheat Moth, a name applied to the *Tinea granella*, a species of *Moth* (q. v.) representing the family *Tineidæ*, and which lays its eggs in wheat grains. It is allied to the Clothes' Moth (q. v.).

Wheat'on, Henry, an eminent American jurist and publicist, was born at Providence, Rhode Island, November 27, 1785, graduated at Brown University in 1802, was admitted to the bar, and spent the next two years in Paris and London. On his return he settled in New York in the practice of his profession, in 1812 became editor of the *National Advocate*, and in 1815 a Justice in the Marine Court, publishing in the same year a valuable *Digest of the Law of Marine Captures and Prizes*. From 1816 to 1827 he filled the place of reporter of the proceedings of the Supreme Court of the United States, and his invaluable *Reports of Cases Argued and Determined in the Supreme Court of the United States*, in 12 vols., have been termed 'the Golden Book of American Law.' In 1827 he was appointed by President Adams First Chargé-d'Affaires to the Court of Denmark, in 1834 he was transferred to the Court of Prussia, and in 1837 appointed Minister Plenipotentiary to the King. Recalled by President Polk in 1846, he had scarcely accepted the Chair of International Law in Harvard University, when he died at Dorchester, March 11, 1848. W.'s other works were, *The Elements of International Law* (1836), *Histoire du Progrès du Droit des Gens en Europe depuis la Paix de Westphalie jusqu'au Congrès de Vienne* (Leip. 1841), a prize essay of the French Institute, afterwards remodelled, enlarged, and published in English under the title, *History of the Law of Nations in Europe and America, from the Earliest Times to the Treaty of Washington* (New York 1845).

Wheat'stone, Sir Charles, F.R.S., D.C.L., LL.D., a celebrated electrician and physicist, was born in February 1802, at Gloucester, where his father was a music-seller. He was brought up to the trade of a musical instrument maker, and, soon after beginning business in London in 1823, he displayed a singular aptitude for experimental research in his *New Experiments on Sound*, which appeared the same year in Thomson's *Annals of Philosophy*. In 1832 he communicated to the Royal Society a paper *On the Acoustic Figures of Vibrating Surfaces*, and two years later was appointed professor of natural philosophy at King's College, London. Here he executed his researches on the velocity of electric transmission by means of

revolving mirrors—a method of experiment which has been used by others with great success in other departments of physics—for example, by Fizeau in his determination of the velocity of light. He early turned his attention to spectrum indications, and pointed out the possibility of distinguishing metals according to the spectrum character of the electric spark passed between them. In the measurement of electrical resistance, his name is handed down to posterity as the inventor of *W.'s Bridge* (see ELECTRICITY). Other important inventions are his 'polar clock,' for ascertaining the time by the position of the plane of polarisation of the light of the polar sky; the catoptric Stereoscope (q. v.); and the Kaleidoscope (q. v.). His greatest fame, however, rests upon his practical applications of electricity, and especially upon the position he holds as one of the founders of the electric telegraph (see TELEGRAPH). He was knighted in 1868, elected a foreign member of the Academy of Sciences in Paris in 1873, and one of the eight foreign associates of the same in 1875, and had besides upwards of thirty foreign distinctions. He died at Paris, October 19, 1875. Though he never published, save in scientific journals and transactions, he has left behind him a lasting memorial in the discoveries, applications, and inventions which have so changed the aspect of the world's civilisation within the last half-century. The council of King's College, London, have decided (1879) to give the name of the 'W. Laboratory' to their physical laboratory, where W. made his early researches, and to which he bequeathed his valuable scientific apparatus.

Wheel, Breaking on the, a mode of inflicting death, formerly in use in various countries of Europe, in which the victim was placed upon a wheel, with his arms and legs extended along its spokes, and the wheel being rapidly turned round, his limbs were broken by repeated blows from an iron bar. Sometimes two or three blows—*coups-de-grâce*—were given to shorten the sufferings of the victim. This barbarous punishment, now happily a thing of the past, still lives in the word *roué* ('a rake'), the past participle of the French verb *rouer*, 'to break upon the wheel.'

Wheele'ra, or **By'ra,** is a genus of *Leguminosæ*, consisting of three species. *B. ebenus* (the Jamaica or W. Indian ebony-tree) is a small tree, the wood of which is very hard and ponderous, sinking in water. It takes a fine polish, and is used for making various small-wares, but has no affinity with the true ebony. It is also used by tanners and dyers under the name of green ebony.

Wheel and Axle, in mechanics, is a modification of the Lever (q. v.), much used in wheel-work and other combinations of machinery. It consists essentially of two different-sized wheels, which can rotate as a rigid system about the same axis. A force applied to the circumference of the smaller wheel or *axle* is balanced by a force applied to the circumference of the larger *wheel*, which is less than the former force in the ratio of the radius of the axle to the radius of the wheel. The system, indeed, acts as a lever, whose arms are the radii and whose fulcrum is the common centre, and supplies an efficient means for overcoming a great resistance by a comparatively small force acting tangentially at the circumference of the wheel. The windlass is a familiar example of a simple W. and A., and the principle is again met with in the Flywheel (q. v.).

Wheel'ing, capital of W. Virginia, U.S., 92 miles S.W. of Pittsburg by rail. It has over 20 churches, a library, theatre, 3 daily and 5 weekly newspapers. The surrounding country is rich in bituminous coal, and has 5 blast furnaces, 7 nail factories, numerous foundries and other ironworks. A great railway centre, W. also carries on an important trade by river; and in 1875, 73 steamers and 128 barges (aggregate tonnage, 9891 tons) were registered here. Pop. (1870) 19,280; estimated in 1876 at 30,000. Settled in 1774 and incorporated in 1806, it was made the capital of W. Virginia in 1863.

Wheelwork is any combination of wheels for transmitting or regulating motion. The essential element in all such combinations is of course the wheel, which is simply a form of lever so contrived that the power can be applied continuously and uniformly. The use of wheels to facilitate locomotion dates from a very early period in the history of civilisation, as is evidenced by the frequent references to them in the oldest known literature, the Indian *Vedas*; and the carriage or chariot was probably a gradual development from the cylindrical tree-trunk placed as a roller beneath a load. In the action of a roller we recognise a particular case of what is known in the kinematics of machinery as motion by *rolling contact*, the general principle of which is that the points of contact of the surfaces of the two moving pieces are at the instant of contact moving in the same direction with the same velocities. Hence the linear velocity of a smooth rack in rolling contact with a roller rotating round a fixed axis is equal to the product of the angular velocity of the roller into the distance of the contact-points from the centre of rotation; and this is always the measure of the relative velocity of the rack and roller, whatever the apparent velocity of either may be; whether, as in a carriage-wheel, the rack is fixed and the roller moves, or, as in translation by means of movable rollers, both rack and roller move. In the latter case there are really two smooth racks, the road and the object moved, and the object evidently progresses at twice the rate of the intermediate roller. An important case of rolling contact is that of two wheels or rotating pieces. If their axes are fixed, the kinematical condition of rolling contact between these wheels requires that their angular velocities are inversely as their radii. The ratio between these angular velocities is called the *velocity ratio*, and indicates the speed with which the axis of the one wheel should rotate for a given speed of the axis of the other. In circular cylindrical wheels, by which motion is transmitted between parallel shafts, the wheels rotate in the same plane, and the velocity ratio is constant. If both rolling surfaces are convex, the case is one of *outside gearing*, and the wheels rotate in opposite directions; if one surface is concave, the case is one of *inside gearing*, the one wheel rolling inside the other, and both rotating in the same direction. To transmit a constant velocity-ratio between shafts which intersect, the rolling surfaces must be portions of right cones with their vertices at the point of intersection. If the shafts are not parallel and do not intersect, the surfaces must be frustra of hyperboloids of revolution, which touch along a common generating line. With smooth rollers, however, it is practically difficult to transmit rapid motions on account of the slipping of the surfaces in contact. The friction of contact may be increased by cutting circumferential wedge-shaped grooves in the rollers, so adjusted that the projections on the one fit into the recesses of the other, as in what is known as *frictional gearing*. Not even by this means, however, is slipping altogether prevented. The most usual method of communicating motion between two wheels or between a wheel and a rack, so as to preserve an absolutely constant velocity ratio, is by means of *teeth*. These consist of a series of ridges alternating with hollows or spaces, set nearly parallel to the lines of contact of the imaginary toothless surfaces which would transmit the same velocity ratio as the toothed wheels do. These imaginary rolling surfaces are called the *pitch-surfaces*; and it is with reference to them that a wheel is first designed and the form of the teeth deduced. According to the form of the pitch-surfaces, wheels are classified as *spur-wheels*, with cylindrical pitch-surfaces; *bevel-wheels*, with conical pitch-surfaces; and *skew-bevel wheels*, with hyperboloidal pitch-surfaces. The *pitch-line* is the section of the pitch-surface with a surface perpendicular to it and the axis of rotation. This orthogonal surface is a plane perpendicular to the axis in spur wheels, a sphere with centre at the apex of the conical pitch-surfaces in bevel wheels, and an ellipsoid of revolution confocal with the hyperboloidal pitch-surfaces in skew-bevel wheels. In toothed wheels the *pitch* is the distance, measured along the pitch-line, from the front of one tooth to the front of the next. For wheels which rotate continuously, the pitch must be an aliquot part of the circumference; and in order that a pair of wheels may work together the pitch must be the same in each. The velocity-ratio of such wheels is then given as the ratio of the number of teeth in the one to the number of teeth in the other. The dynamics of toothed gearing is that the teeth of the one wheel called the *driver* push against those of the other or *follower*, and during the action sliding takes place between the pairs of teeth in contact in a direction across their lines of contact. Here is what is called *sliding contact*, the general principle of which is that the components, along the common normal to the surfaces in sliding contact of the velocities of the points of contact are equal; and for theoretically perfect gearing this normal at any instant should

pass through the line of contact of the imaginary pitch-surfaces of the wheels. A glance at the existing conditions of wheels in toothed gearing will show that the relative sliding motion of any two teeth in contact is such that the roots of the teeth approach with constantly-diminishing velocity, until for an instant they are stationary relatively to each, after which they recede with constantly-increasing velocity until they are beyond each other's influence. At this instant, when the relative sliding motion is changed from *approach* to *recess*, the point of contact of the teeth should be coincident with the pitch-point or point of contact of the pitch-lines. Hence the path of the point of contact of the teeth passes through the pitch-point, and is divided by it into two portions, known as the path of approach and the path of recess; and in general the lengths of these paths must be so adjusted that two pairs of teeth at least shall be in contact at any instant, though in certain cases this is not possible. Now the relative motion of any two wheels is equivalent to the rolling of the one wheel upon the other fixed, the instantaneous axis of rotation passing through the pitch-point (see ROTATION). Hence, in order that the teeth may remain continuously in contact, the form of the tooth of the fixed wheel should be the envelope of the successive positions of the tooth of the rolling wheel. Given the form of tooth of one wheel, then it is a comparatively simple geometrical problem to find the proper form of the tooth of another wheel to gear with it. Only certain forms of teeth, however, are practically realisable as wheel teeth, those forms being avoided which would make the complementary teeth entirely concave. It is impossible here to enter into a discussion of the best forms of teeth for practical ends; for an account of these, the reader is referred to the standard treatises given below.

For uniform working, it is evident that the teeth of the wheels in gearing should be equal and similar to one another; and to preserve this uniformity the more effectually, each given tooth in one wheel should work with as many different teeth in the other as possible. From this point of view, then, the numbers of teeth on the pair of wheels should be either prime to each other, or such as to have their greatest common measure as small as possible. The former condition is satisfied by a pair of wheels, the numbers of teeth on which are the numbers which express in its lowest terms the velocity-ratio to be transmitted by the gearing. Should the velocity-ratio be expressible by the quotient of two numbers, one of which at least is smaller than the minimum number of teeth realisable in practice, it becomes necessary to take equal multiples of these numbers as the numbers of teeth to be employed; and then, if the exactness of the velocity-ratio is not of paramount importance, the evil of frequent contact between the same pairs of teeth is avoided by giving an additional tooth, called a *hunting-cog*, to the larger of the two wheels. If the velocity-ratio exceeds 6, it is usually more advantageous to employ a *train of W.*, which consists of more than two axis, each having upon it two wheels, one of which acts as follower to the driving wheel on the preceding axis, and the other as driver to a wheel on the succeeding axis. The last variety of W. is that included under the name *banded* or *belted* wheels. Here rotation is transmitted from one wheel to another at a little distance from it by connecting them with an endless band or belt, tightened so as to cause sufficient friction to make the belt adhere to the surface of the wheel with which it is in contact. Necessarily, of course, there is slipping, especially at great speeds, so that the velocity-ratio transmitted cannot with certainty be calculated. In the ease and comparative silence with which they work, in the facility they offer for transmitting motion between wheels at some distance apart, and in the readiness with which by their means the motion may be reversed, banded wheels have over teethed wheels certain advantages which commend them for various purposes. For complete systematic treatment of the subject, see Rankine's *Machinery and Millwork* (3d ed. 1876), or his *Applied Mechanics* (9th ed. 1878), and Unwin's *Elements of Machine Design* (2d ed. 1878).

Whelk (*Buccinum undatum*), a species of Gasteropodous Mollusca, common around British coasts, and typically representing the family *Buccinidæ*, in which the shell has a prominent notch for the passage of the breathing-siphon, the shell itself having a large dilated body-whorl and an expanded aperture. The W. is popularly named the 'Roaring Buckie' in Scotland, from the well-known sound heard when the shell is applied to the ear. The mollusc is of carnivorous habits, and feeds on garbage and refuse, acting in this way as a sea-scavenger. It is eaten by the poorer classes in London and other large towns, but the flesh is rather tough and unpalatable. The Dog W. is the *Purpura lapillus*, a gasteropod belonging to the same family as *Buccinum*, and the name Dog W. is also given to species of the allied genus *Nassa*, in which the lip of the shell has a projection wanting in Buccinum itself.

Whew'ell, William, Rev., D.D., the Eratosthenes of his time, was the son of a Lancashire tradesman, and was born 24th May 1794. When he went up to Trinity College, Cambridge, in 1812, he is reported to have been a raw and unpolished youth; but he had already done good work at the grammar-schools of Lancaster and Haversham, and he soon showed what stuff he was made of, and became the natural associate of many of the best students in the university, Herschel, Richard Jones, Julius Charles Hare, and Hugh James Rose. In 1814 he gained the Chancellor's medal for the English prize poem, and in 1815 he took his B.A., and obtained the position of second wrangler. For the next eight years he was engaged as a private tutor, but at the same time was laying the first stones of his literary reputation. From 1828 to 1832 he held the chair of mineralogy in Cambridge, and from 1838 to 1855 he was professor of moral theology or casuistical divinity. In 1841 Sir Robert Peel appointed him Master of Trinity in room of Dr. Wordsworth, who had resigned, and in 1855 he became vice-chancellor of the university. His death, 6th March 1866, was the result of a fall from his horse. It was of Dr. W. that Sydney Smith said, 'Knowledge is his forte and omniscience is his foible,' and the epigram hits off what was the predominant characteristic of his intellect. In his college days we find him already, as he himself puts it, under the spell of the demon of universal knowledge. His friends appear to have warned him of his danger, but it was his fate, and no one can now say that the fate was an unenviable one. He was at once a proficient in mathematics and mechanics, a geologist and a mineralogist, a philosopher both in logic and morals, a political economist, a grammarian, and a student of architecture, and as Sir John Herschel said of him, a more wonderful variety and amount of knowledge in almost every department of human inquiry was perhaps never in the same interval of time accumulated by any man. Besides a number of text-books in mathematics and mechanics which helped to introduce the continental methods into England but are now superseded, W. wrote *Astronomy and Physics, considered with reference to Natural Theology, being the third Bridgewater Treatise* (Lond. 1833, new ed. 1864); *The History of the Inductive Sciences* (3 vols. 1837); *The Philosophy of the Inductive Sciences* (2 vols. 1840), which was afterwards remodelled and divided into three parts, published separately—I. *History of Scientific Ideas*, II. *Novum Organon Renovatum*, III. *The Philosophy of Discovery*; *History of Moral Philosophy in England* (1852); *On the Plurality of Worlds* (1853), in which he took the negative side; and *Lectures on Political Economy* (1863). He took part in the discussion about English hexameters, and supported the innovators by argument and example; he translated *The Platonic Dialogues for English Readers* (3 vols. 1859-61) and Auerbach's *Professor's Wife*; and he edited Grotius 'De Jure Belli' (1853) and the mathematical works of Barrow (1860). Isaac Todhunter has written *W. Whewell: an Account of his Writings* (Lond. 1876, 2 vols.), and a formal Life by Stair Douglas and W. Aldis Wright is promised.

Whey is the portion of milk which separates as a thin, greenish, clouded liquid, when by the addition of rennet, as in cheese-making, or other acid substance, the milk curdles and the casein portion takes the form of curd. The W. carries with it the greater part of the milk-sugar and some portion of nitrogenous matter in the form of albumen and lacto-protein. By boiling the W. the greater part of the latter constituents can be separated as a nutritive thick white scum which rises to the top of the fluid, and the remaining liquid is used for feeding pigs, &c., or it may even be drunk with advantage and used in place of water for making Scotch porridge. Alum W. used in diarrhœa is prepared by coagulating milk with alum and separating the W. And the orange and lemon W. used in medicine are made by coagulating with citric acid, and flavouring the resulting W. with orange or lemon peel.

Whid'ah (corruptly 'Widow') **Bird**, the name given to a species of *Insessorial* birds allied to the Weaver (q. v.). It inhabits W. Africa, and is noted for the peculiar development of the tail-feathers. The webs of the two central feathers are very broad, and the shafts protrude without a web. The next two feathers—one on either side—are extremely long, and may measure upwards of 10 inches in length. This disposition of feathers is typical of the broad-shafted W. B. (*Viduia paradisea*), which attains a length of 5 or 6 inches, and is of a brown-black hue above, and pale buff below, with an orange collar. The Shaft-tailed W. B. (*V. regia*) is so named from its four central feathers presenting the bare shafts without any web. The colour is a dark brown, and the length from 9 to 10 inches.

Whig and Tory, the political designations that, superseding the older 'Roundhead' and 'Royalist,' were fastened upon the petitioners and abhorrers of the Exclusion contest (1679), and that after continuing in vogue for 150 years have in turn been almost superseded by 'Liberal' and 'Conservative.' *Whig* had been applied as early as 1648 to the Covenanters, but authorities differ as to its etymology, Defoe maintaining 'the word to be taken from a mixed drink the poor men drank in their wanderings, composed of water and sour milk' (*whey*); Bishop Burnet asserting that western drovers 'were called Whiggamores, and shorter Whiggs, from a word *whiggam*, used in driving their horses;' and a third derivation being from the initial letters of the Puritan motto, 'We Hope In God.' *Tory*, on the other hand, is said to come from the Erse *toir* or *thabhair*, 'to give,' and to have been the 'Stand and deliver' of the Irish Rapparees or Popish outlaws, from whom it was transferred to supporters of the 'Popish Plot.'

Whim'brel (*Numenius phæopus*), a species of *Grallatorial* or wading bird, allied to the Snipe (q. v.). The bill is curved from the base, and the upper mandible projects over the lower. The first quill is the longest, and the tail is short and even. The tarsi have narrow scales in front, and the hinder toe is slender and partially rests on the ground. The W. is known also as the Jack Curlew and Half Curlew. In the Shetland Isles it is named the 'Tang Whaap.' The W. has a brown-tinted plumage. The average length is about 16 inches. In Sussex the bird is called the 'Titterel,' from the cry.

Whin or **Whin'stone**, a name given by miners and others in Scotland to various hard crystalline rocks, of igneous or metamorphic origin, especially greenstone or Diorite, and sometimes, though rarely and locally, applied even to granite.

Whin'chat (*Pratincola rubetra*), an *Insessorial* bird allied to the Stonechat (q. v.), and named from inhabiting furze or 'whin' bushes. The average length is 5 inches. The W. is brown above and buff beneath. The throat is white, and the tail is white at the base, a white stripe extending from the chin to the shoulder. The bird is captured in autumn as a table delicacy, when fat and in good condition. It arrives in Britain in the middle of April, the young being born at the end of May or in the beginning of June. The nest is built on the ground, and contains from four to six eggs of bluish-green hue speckled with brown.

Whipp'ing, a form of corporal punishment once common in this country, but now rarely resorted to, except in the case of boys under sixteen, and in the case of robbery, assaults with intent to rob, &c., according to 26 and 27 Vict., c. 44. This Act does not apply to Scotland, where no crime against person or property is punishable in this manner. The most severe form of W. formerly existed in Russia, where the knout, a whip of plaited thongs interwoven with wires, was greatly used. The pleti, a kind of lash, has been substituted for this instrument of torture. W. is abolished as a criminal punishment in the greater part of the United States. In ancient Rome, scourging was considered the deepest dishonour, and might not be administered to a citizen. The advocates of W. contend that it is more effectual as a restraining influence with a certain class than imprisonment.

Whip-poor-Will, the name—derived from the cry of the bird—of the *Chordeiles vociferus*, a species of *Caprimulgidæ*, or Goatsucker (q. v.), inhabiting the United States. The average length of this bird is about 10 inches, and its plumage is dark, with a white band on the throat. The W.-P.-W. has all the characteristics of Fissirostres (q. v.), and captures insects on the wing. Its flight is near the ground, and takes place in zigzag fashion. The Chuck-Will's-Widow (q. v.), an allied species, occurs in the southern parts of the United States.

Whirl'pool, a vortex or eddy produced by the meeting of two or more different currents of water. Such phenomena are frequent along broken coasts, but then they exist only on a small scale. A large W. would, no doubt, be as dangerous to navigation as whirlwinds are to property on land; but their danger is probably much over-rated. The famous Malström (q. v.) is hardly a W. at all, but simply a strong current; and the same was probably the case with the fabled Charybdis (see SCYLLA). Whirlpools are special instances of vortex motion, and have the essential characteristics of all rotatory motion in fluids. See WINDS.

Whirl'wind, a vortex column of air similar in character but much less extensive than typhoons and storms of all types (see WINDS). The meeting of two or more differently directed currents of air is the cause of all whirlwinds, which invariably have a progressive as well as a whirling motion. The more rapid this whirling motion the more destructive in its effects is the W. It occurs most frequently in tropical countries where the thermal states of the atmosphere are most favourable for their production. In advancing over a desert the W. is accompanied by a column of sand and dust; and somewhat similar in its formation is the liquid column which is the essential character of a Waterspout (q. v.).

Whis'ky (Gael. *uisge*, 'water'), a spirit distilled from grain, 'raw' or malted, and largely used as a beverage and intoxicant in northern climates, particularly in Scotland and Ireland, of which it is the national drink—'the wine of the country.' It is known under various distinctive names, having reference generally to the localities where the manufacture is carried on, such as Islay, Glenlivet, and Campbeltown in Scotland; while in Ireland there are distilleries situated in various parts of the country, but those of Dublin, Banagher, and Cork hold the leading position. W. is made principally from barley, the finest qualities of which are used for that purpose; and the manufacture consists of two distinct processes—that of fermentation, by which a fermented liquor is produced; and distillation, by which the spirit is obtained from the fermented liquor. The process of fermentation is precisely the same as that utilised in the brewing of ale and beer, but the mash may be prepared with unmalted as well as malted grain. The products of the distillation are different according to the class of still in which the operation is conducted. When distilled in the common pot-still the first product is 'low wines,' a weak alcoholic solution which must be submitted to repeated distillation or rectification till it attains sufficient strength and purity. When the 'attenuated worts,' as the fermented liquor is called, is distilled in the coffey-still, the spirit is obtained at one operation in a concentrated condition, and the W. so made is known as 'silent' spirit on account of its freedom from the flavour that characterises 'Pot W.' What is known as 'proof spirit,' the standard by which duty is levied and alcoholic strength gauged, consists of almost equal parts of pure alcohol and water, the proportion of alcohol being 49¼ by weight. The strength at which W. is ordinarily 'bonded' or placed under charge of customs officials is 11 per cent. overproof, so that it can be stored for several years for the purpose of maturing before it falls below proof strength. As usually sold by retail dealers, it is from 10 to 20 per cent. under proof.

The duty on spirits is a large source of revenue to the government of this country, the rate being 10s. per proof gallon. In Ireland W. was first subjected to fiscal regulations in the reign of Charles II., when in 1661 an excise duty of 4d. per gallon was charged, which in 1717 was increased to 8d. That duty in 1719 produced a revenue of £5785. The increase in the consumption is shown by the fact that in 1791, by which time the duty had been increased to 1s. 2d. per gallon, the amount realised from it was £204,648. In 1814 the duty had been raised to 5s. 6d., and shortly afterwards to 6s., but the high rates gave rise to a large amount of smuggling and illicit distillation, and consequently the duty was again reduced to 2s. 4d. per gallon. In Scotland the experience of the high rate of duty previous to that time had been the same,—that it led to an extensive defrauding of the revenue, particularly in the Highlands, where the facilities for illicit distillation were very great, and in 1823

the duty was similarly reduced, with the effect of largely increasing the quantity on which duty was paid. Since then the duty has varied frequently until about 1860, when it was fixed at 10s. per proof gallon, at which it still remains. From the beginning of the present century, the consumption of spirits has increased to a very remarkable extent. In 1800 the quantity of home-made spirits charged with consumption duty in the United Kingdom was—

England	4,352,888	imperial gallons.
Scotland	1,277,596	„
Ireland	1,330 500	„
	6,960,984	„

yielding a total amount of duty of £1,370,054. By 1825 the quantity had increased to 18,928,342 gallons, yielding a duty of £3,884,830, while in 1850 the quantity was 23,862,585 gallons, yielded £5,948,467. In 1875 the quantity consumed was—

England	16,737,366	gallons.
Scotland	6,990,170	„
Ireland	6,094,038	„
	29,821,574	

Later years show rather a decrease in the quantity consumed. In 1878 the quantity of home-made spirits paying duty for consumption was 29,358,715 gallons, being 529,461 gallons less than in the preceding year. The excise duty on spirits for the year ended 31st March 1878 amounted to £15,313,276.

Whist, the most intellectual if not the most popular of all card games. It is of English origin, although within recent times it has become fully naturalised throughout Europe. The number of special W. clubs in existence, and the fact that the members of these clubs belong to all ranks of society, are sufficient proofs of the hold which the game has taken on the country of its birth, and of the intensity of its intellectual attraction. Of Continental countries, France is pre-eminently the land where W. has been adopted with favour. The greatest of all players was Deschapelles, and the most elaborate works on the game have issued from France. There is no spot, however, in the whole earth where W. has not been carried as part of European culture. A collection of *W. Studies* was recently published within the tropics; the game forms one of the common winter resources of the inhabitants of British N. America, while in the Australian wilds the farmers play for sheep points with a bullock on the rubber.

The principal feature of modern W. is the cultivation of the relations between the partners in playing what is called the 'combined game.' A player must consider his own hand not independently but in conjunction with his partner's. Obvious as are the advantages of this plan, it only lately came into practice. Of course, as there are several different modes of trick-making, community of system is essential between partners. Dr. Pole shows clearly that the only system which is favourably adapted to a combination of hands, is that of making tricks by 'establishing' and 'bringing in' a *long suit*. For example, if one holds six spades, after a few leads of the suit, he is likely to be left with full command of it, and every card, however small, will then make a trick unless it be trumped. Out of this theory, indeed, arise all the more important of modern rules. Take, for instance, the *management of trumps*, which is so great a difficulty to unsystematic players. The chief obstacle in making long suits is the risk of their being ruffed, and the advantage will be with the party who, having a greater number of trumps, can succeed in drawing those of his adversaries. Five trumps are generally sufficient for this purpose, and hence the rule that, when holding this number or more, one should lead them. Three or four leads will generally disarm both your opponents, and you will still have one or more left to bring in your own or your partner's long suit. Thus, so important becomes the trump lead, that in the modern game a conventional signal or *call for trumps* has been introduced, by which, if the holder of a strong trump-hand cannot get the lead early, he may intimate his strength to his partner and request him to lead in trumps. With three trumps or less a trump lead at the beginning of the game is seldom justifiable; with four much discretion is required in leading. The greatest mischief one can do to a partner's strong trump-hand is by forcing it to ruff, to deprive it of its preponderating strength. On the same principle it is the game to force a strong adverse trump-hand, or, when without any of the required suit, as second player to a trick which it is impossible for your partner to take, to ruff fearlessly if weak in trumps, but to pass the trick if strong. In the former case one's trumps are useless; in the latter, they are more valuable in reserve. The theory gives sure guidance in the *management of plain suits*. The most important *lead* is the first, and in consonance with the theory, it should be calculated as closely as ignorance of the partner's cards will allow, to favour the combined hands, and at the same time to convey to the partner some idea of one's own cards. The lead from the long suit fulfils these conditions, and if the player do not succeed in bringing in the suit, the lead is at all events his safest, for it does not deprive his remaining cards of any advantage resulting from collective strength. Wide experience and close reasoning have determined that of one's long suit it is most generally expedient to begin with the lowest; this gives the partner a chance of making the first trick, and reserves for the player the complete command of the suit subsequently. When one holds several high cards, however, this rule is modified in consideration of the chance of the suit being trumped, and of other contingencies. Certain definite leads have therefore been determined upon for particular combinations. Of these the most useful are the following (all the important cards held being stated in the order of play): king and ace; king and queen; ace, queen, and knave; queen, knave, and ten; ten, king, and knave. The lead of king from king and ace is one of the signals or conventional refinements of modern play. The modern theory further defines the duty of a partner in regard to one's long suit; after showing you his own he should return yours, and in doing this he must *get rid of the command* by playing out his master cards if he holds them. Then, secondly, he must adopt *strengthening* play; for instance, suppose he had originally ace, knave, and four, and has won your first lead with the ace, he must return the knave and not the four. The effect is to raise the rank of your lower cards and to aid in getting lighter ones out of the way. By the new system the second player is bound to play his lowest card, except in certain recognised and well-defined cases. Even the fourth player, easy as his part is, may do great mischief by irregular treatment of small cards or sequences. Convention prescribes that, in playing worthless cards, the lowest shall fall first; from this a partner's inference is that you have nothing smaller. In returning your partner's suit, when you only hold useless cards, you must return the highest if you have only two left; the lowest, if more. The *call for trumps* is given by throwing away unnecessarily a higher before a lower card, *i.e.*, by a recognised departure from the ordinary rule. The legitimacy of this signal has been questioned, but it has already found its way into extensive use, and it is difficult to see any sound objection to a convention which has not been privately arranged, and which is therefore as significant to an adversary as to a partner. In addition to the rules referred to, a few may be given here; rules and descriptions of the game abound in W. books. An important rule is to lead your own suit before returning your partner's, *unless he leads trumps*, which return immediately. Again, in returning your partner's suit, if you have only two left, play the highest; if more, the lowest. In any position, if you hold the best card, play it in the second round. *Holding five trumps, lead them* or call for them. Watch for your partner's call for trumps, especially if you are weak in them. Do not trump a doubtful trick second in hand if you hold more than three trumps; with three or less trump fearlessly.

The early history of W. is involved in obscurity, but as early as the 16th c. a card game was commonly played which was not only called by a name still used in W., but which had one element in common with the modern game. *Triumph* (corrupted into *trump*) took its peculiar character from the predominance of one particular suit over all others, and this suit was called the triumph or trump suit. Triumph was of Continental origin, a work published in Italy in 1526 speaking of it as *Trionfi*, and Rabelais including *la Triumphe* among the games played by Gargantua. That the game early became popular in good English society is evident from its being used as a similitude by Latimer in a sermon preached at Cambridge in 1529. The divine uses both the original and corrupt appellation of the game. At a later period references to it are more frequent; worthy of note are those in *Gammer Gurton's Needle*, and in Shakespeare's *Antony and Cleopatra*, act iv., sc. 12. Triumph appears to have been played in several ways; in some forms it resembled the present Écarté. To W., except in the predominance of the trump suit, it bore little

resemblance. About the beginning of the 17th c. the game had taken another name, which is also preserved in W., namely, *Ruffe.* Cotgrave, in his *French and English Dictionary*, 1611, defines the French word *triomphe* as 'the card-game called ruffe or trump;' and Nares in his *Glossary* says 'ruff meant a trump card, *charta dominatrix.*' The game itself had by this time departed considerably from the foreign type, certain advantages or 'honours' having been added to the four highest trump cards. To distinguish between the old and new forms of the game, the one was called 'French ruff,' and the other 'Ruff-with-honours.' The latter was played with 52 cards, the highest being the ace. There were four players, or two sets of partners. Each got 12 cards; the remaining four were left on the table as a stock, and the top one was turned up to determine the trump suit. The player who held the ace of trumps could take the stock in exchange for four cards of his own, an operation called *ruffing.* Three honours in the joint hands were reckoned as equivalent to two tricks, and four honours to four. This was a near approach to the modern game, to which it was still more closely approximated by further changes, as well as by the radical alteration in the name, effected early in the 17th c. The first form of the new designation was *Whisk*, a word which occurs in Taylor the Water Poet's *Motto*, published in 1621. The derivation of the word is very doubtful, but it has been suggested that it was originally used by the common people as a synonym for *ruff*, in ridicule of the article of dress then so fashionable. Some thirty years later the name had assumed its present form, of which the earliest known literary use is quoted by Johnson from the second and spurious part of *Hudibras*, published in 1663. A curious book, *The Compleat Gamester, &c.*, bearing date 1674 and ascribed to Charles Cotton the poet, contains a description of 'Ruff-with-honours (*alias* slamm) and W.,' which are stated to be 'games so commonly known in England, in all parts thereof, that every child almost of eight years old hath a competent knowledge in that recreation.' After describing Ruff-with-honours, the author says, 'W. is a game not much differing from this.' The ruffing privilege was then abolished; each player still had 12 cards, but instead of leaving an unknown stock on the table, the four deuces were discarded before dealing. Cotton, who never alludes to the earlier name Whisk, says 'the game is called W. from the silence that is to be observed in the play.' This derivation has passed into common acceptance, but the older word, 'whisk,' remained in use for a century after Cotton wrote. Johnson says W. is 'vulgarly pronounced whisk;' but the Hon. Daines Barrington, writing (1786) on card games, adopts without qualification the latter orthography. During the 18th c. the game was chiefly played in low society, and great part of Cotton's chapter is devoted to an exposure of the tricks and frauds with which it had become associated. It was rescued from obscurity by a party of gentlemen, including the first Lord Folkestone, who began about 1730 to play regularly at the Crown coffee-house in Bedford Row. Edward Hoyle, probably one of the party, appeared about this time, and gave to W. its permanent, logical, scientific shape. Little is known of Hoyle, except that he was born in 1672, described himself as 'a gentleman,' moved in good society, and, with the object of exciting a legitimate interest in W., took to teaching it professionally. His written instructions to his pupils were sold in MS. at a guinea a copy, and these having been pirated, the author, to secure his copyright, published them under the title of *A Short Treatise on the Game of W., &c.* (Lond. 1743). Sixteen editions of his work had appeared before the author's death, which took place on 29th August 1769. From this time W. advanced rapidly in public favour, finding its way to Court (about 1754) and to the Universities, as appears from No. 33 of the *Idler* (1758). At Bath, then, one of the chief seats of W., and the scene of the exploits of Nash and such celebrities, there issued about 1800 a sound, practical work entitled *Advice to the Young W. Player*, by Thos. Matthews. It contained many improvements, resulting from the experience of half a century. About the same date an important change took place, namely, the introduction of 'Short W.' by reducing the winning score from ten to five, and abolishing the 'call' for honours when wanting two of game. The new form came quickly into favour, and has for many years entirely superseded Long W. in the best circles. Translations of Hoyle early carried W. into France, where it was played by Louis XIV., and, under the Empire, was a favourite game of Josephine and Marie Louise. After the Restoration a French writer remarked that 'the nobles had gone to England to learn to think and had brought back the thinking game.' The great player of the day was Talleyrand, and a commonplace in W. books is his *mot*—'You do not know whist, young man? What a sad old age you are preparing for yourself!' In 1839 M. Deschapelles published his *Traité du Whiste*, the fragment of a larger work which never appeared. The next important step in the development of the game was taken during the decade 1850–60, when a youthful coterie at Cambridge set themselves to a rigorous examination of its scientific scope. Since the general adoption of Short W. the widespread practice in playing had led to many minor improvements, but still players were guided by the precepts of Hoyle and Matthews. The little W. school formed at Cambridge held together in London, and in 1862 one of its members, 'Cavendish,' issued his celebrated work, *Laws and Principles of W.* (12th ed. 1879), which illustrates the modern play by a set of model games, giving detailed rules for practice. Two years later appeared *A Treatise on Short W.*, by the late Mr. James Clay, M.P., forming an able commentary on refined points of the best modern play. Dr. Pole, in *The Modern Scientific Game of W.* (Lond. 1865; 8th ed. 1877), expounds the fundamental W. theory, and in an article in the *Fortnightly Review* for April 1879, entitled *Conventions at W.*, discusses the legality of signals. Hayward, *Biographical and Critical Essays* (new series, Lond. 1873); Ebersberg, *Das edle W.* (7th ed. Vien. 1877); and Colonel Drayson, *The Art of Practical W.* (Lond. 1879).

Whis'ton, William, an English theological writer, born 9th December 1667, at Norton in Leicestershire, was the son of the rector of the parish. He studied at Cambridge, where he took his degree in 1690 and obtained a fellowship in 1693, distinguishing himself particularly in mathematics. In 1696 Bishop Moore of Norwich appointed him his chaplain, in 1698 he became vicar of Lowestoft, and in 1703 Sir Isaac Newton helped to procure him the Lucasian professorship of mathematics which he had himself resigned. The zealous profession which W. soon afterwards made of Arianism caused his expulsion from the university in 1710; and soon after being practically, though not formally, cut off from the Church of England, he first formed a society for the study of primitive Christianity, and afterwards joined the General Baptists. Till his death, 22d August 1752, he continued to advocate his peculiar doctrines by tongue and pen. W.'s chief works are *New Theory of the Earth, from its Original to the Consummation of All Things* (Lond. 1696), written in opposition to Burnet's theory; *The Accomplishment of Scripture Prophecies, being the Boyle Lectures for* 1707 (Lond. 1708), in which he maintains that all prophecies have but one meaning; *Prælectiones Physico-Mathematicæ* (Camb. 1710), being a popular explanation of the Newtonian philosophy; *Historical Preface to Primitive Christianity Revived* (Lond. 1710), the work which caused his condemnation by convocation; *Primitive Christianity Revived* (Lond. 5 vols. 1711–12), in which he maintains the authenticity of the *Apostolic Constitutions*, *Vindication of the Sibylline Oracles* (1715); *Hist. Memoirs of Dr. Samuel Clarke* (1730); and *The Genuine Works of Flavius Josephus, translated from the Original Greek* (1737). This last work has been remarkably popular, but is the only one of W.'s fifty productions of which popularity can be predicated. See *Memoirs of Mr. William W., written by Himself* (Lond. 1749–53); Farrar's *Critical Hist. of Free Thought* (Lond. 1863); Hunt, *Religious Thought in England* (Lond. 1873).

Whit'by, a seaport in the N. Riding of Yorkshire, 54½ miles E.N.E. of York by rail, stands looking northward over the German Ocean, just where the Esk, leaving its wooded dells, forms a broad tidal pool walled in by jet-veined cliffs of alum shale. Under and creeping up these cliffs lies the old fishing-town, with quaint wooden-gallleried houses; above to the W. are the fashionable terraces of Hudson, the Railway King (1845); and the loftier E. cliff is crowned by the ruins of the matchless Abbey, the gables namely of its Early English choir, with row upon row of exquisite lancet windows, the northern transept, and part of the pure Decorated nave—all until 1830 surmounted by a great central tower. A cruciform Norman church, gained from the town by a flight of 190 steps, crouches in picturesque unloveliness beside the Abbey, to whose S. is the 16th c. W. Hall. None of four modern churches has any beauty, but the Catholic chapel is a good Early English structure, harmonising better with

its surroundings than does a red brick Concert Hall (1878) in 'Queen Anne' style. The outer harbour is sheltered by two stone piers, 215 and 520 yards in length, on the western and longer of which a lighthouse stands, and a museum with a splendid collection of native fossils. The whale-fishery (1733–1837) has quite died out, but coal-shipping and the herring fishery employ (1879) 206 coasters and 268 fishing-boats, while in 1878 there entered 797 vessels of 103,790 tons, and cleared 749 of 92,982 tons, the imports of foreign and colonial produce amounting (1877) to £4872. A W. 'prentice, Captain Cook, chose W.-built vessels as 'the best and stoutest bottoms in England' for his great circumnavigation of the globe, and W. shipyards keep up their ancient fame, turning out (1874–78) 26 iron steamships of 21,839 tons. But the jet manufacture, employing some 1500 persons, and with an annual value (1876) of nearly £100,000, is Whitby's specialty, and the alum manufacture, sailmaking, and rope-spinning are largely carried on. W. returns one member to Parliament, and publishes two weekly newspapers. Pop. (1871) 13,094, a number likely to be much increased by the opening of the railways to Scarborough and Saltburn. In 657 St. Hilda founded her double house for nuns and monks at Streoneshalk (the 'Lighthouse Bay'), and hither in 664 King Oswi summoned the champions of Roman and Celtic rites to the famous Synod in which Rome's victory, won by St. Wilfrid over Colman, rescued the English Church from her Irish sister's chaos. Here Cædmon lived and died, and here St. John of Beverley was bred. The ammonites of the Scar, those headless snakes changed by her prayers into a coat of stone, preserve St. Hilda's fame; but in 867 the Danish Vikings not only burnt her Abbey, but altered the very name *Streoneshalh* to *Whit-* or *Priest-by* ('white' or 'priest's house'). William de Percy in 1073 refounded the Abbey under the Benedictine rule, not for the mythical nuns of *Marmion*, but monks alone. With Scott's great poem and Mrs. Gaskell's *Sylvia's Lovers* (1863) most readers are familiar, and further reference may be made to the works cited in F. K. Robinson's *W. Glossary* (English Dialect Society 1876), itself containing much curious local information.

Whit'church, a town of Shropshire, England, 20 miles N.E. of Shrewsbury by rail. It has a handsome parish church, built in 1772, several dissenting chapels, and trade in hops. Pop. (1871) 3696.

White, Gilbert, a celebrated English naturalist, belonged to a family which as far back as 'the reign of Elizabeth possessed the estate of Swan Hall in Oxfordshire,' and was born 18th July 1720, at the village of Selborne in Hants, which he was destined to render as famous as himself. The young man, who had been under the tuition of Dr. Thomas Warton, father of the better-known Thomas and Joseph Warton, entered Oriel College, Oxford, in 1739, and having become bachelor of arts in 1743, he obtained in the following year a fellowship in his college, which he kept all his life. Receiving deacon's orders in April 1747, he shortly afterwards became curate to an uncle at Swarraton, and in 1751 he removed to the curacy of Selborne. Though in 1758 he accepted from his college the living of Moreton Pinkney in Northamptonshire, he never entered upon residence there, but steadily refusing all further preferment, continued to live a peaceful and uneventful life in the village of his choice, relieving its monotony by not unfrequent visits to London, and finding work enough for even its slowest hours in studying the habits of the animals around him. He died June 26, 1793. His great work, *The Natural History and Antiquities of Selborne*, first published in 1789, is unique in its kind. With all the moral and literary charm of Walton's *Complete Angler*, it unites a scientific accuracy of observation to which Walton can lay no claim, and it consequently continues to be equally in favour with the professional naturalist and the ordinary reader. In the present century it has run through upwards of *thirty* distinct editions, the most recent of which are Bennett's (1874), Buckland's (1875), Harding's (1876), and Bell's (2 vols. Lond. 1877). Mr. Bell, who himself has lived in Selborne for thirty years, has collected all recoverable particulars about the author, and printed for the first time a number of his letters, memoranda, and poems. Of special interest are the letters to his brother, John W., who was chaplain at Gibraltar, and corresponded with Linnæus.

White, Henry Kirke, a butcher's son, was born at Nottingham, August 21, 1785. Precocious talents did not promise to raise him from the rank in which he was born, for he was destined for his father's business, and after school hours delivered meat to customers. His gorge rising at the butchering, he was engaged to a hosier, but, sick of folding stockings, he was apprenticed at last to a solicitor. During leisure hours he mastered half-a-dozen languages. After a few trials in magazines, W. in 1803 published a volume of poems, which remained unnoticed save by a few. Southey and Simeon got him sent to St. John's College, Cambridge, where his brilliant but brief career was ended by consumption, October 19, 1806. Southey published his *Remains*, with a Memoir (3 vols. 1807–22). W.'s verses exhibit a pure, sensitive soul expressing itself in delicate language, but it was in his sad story that the real poetry lay.

White, Joseph Blanco, was born of Irish extraction at Seville, July 11, 1775, and entered at eight his father's counting-house. Hatred of business caused his removal to the Dominican College (1789), whose odious system of scholastic philosophy he presently exchanged for the more congenial Jesuit teachings of the University; and finally, 'with the priesthood forced on him as the indispensable condition of an intellectual life,' he became a sub-deacon (1796). By 1802 he had lapsed from a strong devotion to total unbelief; but in England, his refuge from the French invasion (1810), a perusal of Paley's *Natural Theology* left him convinced of the truth of Christianity; and in 1814, subscribing the Articles, he became a clergyman of the English church. To instance a few more phases of this shifting soul, in 1818 he distinctly abandoned, in 1825 resumed belief in, our Lord's divinity, in May 1834 disapproved denials of the Trinitarian doctrine, and within eight months turned Unitarian. Quitting the palace of Archbishop Whately, where he had lived for some time past, he removed to Liverpool, and there died, May 20, 1841. *A Sonnet to Night* by him lives, while his *Letters from Spain, by Don Leucadio Doblado* (1821) and *Practical and Internal Evidence against Catholicism* (1825) are long forgotten; his posthumous *Autobiography* (3 vols. Lond. 1845) presents a singular picture of an honest and rarely-gifted, but morbid and vacillating, character. See vol. ii. of Gladstone's *Gleanings from Past Years* (Lond. 1879).

White'bait (*Rogenia alba*), a famous species of Teleostean fishes allied to the Herring (q. v.), and distinguished by the presence of teeth on the palatine bones and pterygoids, while the vomer and tongue are also provided with teeth. The W. is usually associated with the ministerial fish-dinner at Greenwich, and is accounted a great delicacy, its flesh being tender and palatable. In spring and summer it occurs at the estuary of the Thames, but is also caught on the S.E. coasts of England in winter. The average length is 5 inches. The W. is eaten fried with bread crumbs. Young herrings and pilchards are often cooked as W. The body resembles that of the herring, but is more compressed.

White'boys, a secret association formed among the Irish peasantry in the beginning of the reign of George III. to resist the enclosure of common land, received its name from its members wearing white smocks during their nightly raids. From demolishing fences the W. proceeded to demand the abolition of tithes and similar grievances, and to the perpetration of agrarian outrages, which led to the appointment of a special commission and the execution of the ringleaders (1762).

White Colours. The principal white pigment, and the most important of all painters' colours, is white-lead (see **Lead**). Baryta yields several commercial varieties of W. C., largely used for adulterating white-lead. The substances used are heavy spar, the native sulphate, and witherite, the native carbonate of baryta. An artificial sulphate of baryta is also used in permanent white. Zinc white or Chinese white is a hydrated oxide of zinc, and pearl white is yielded by the nitrate of bismuth. A fine chalk yields Spanish white, and whiting is ordinary ground chalk. Quicklime is a sanitary white for external walls, &c.

White'field, George, the founder of one of the two great divisions of Methodism, was born at Gloucester, where his father was an innkeeper, March 16, 1714. He was educated at the

grammar-school of St. Mary de Crypt in his native town, and was admitted a servitor of Pembroke College, Oxford, in 1733. Here he became acquainted with John and Charles Wesley and their associates, who had been for some years known in the University by the name of 'Methodists.' W.'s enthusiastic temperament soon carried him beyond all his companions in the austerity of his asceticism and in devotion to works of charity. Failing health obliged him to return to Gloucester, where he was ordained a deacon by Bishop Benson (June 1736). He preached his first sermon with striking effect in Gloucester Cathedral, and in the same year took his degree of B.A. In 1737 he visited London, where his preaching attracted immense crowds and produced the most extravagant physical effects on many of the hearers. In December of the same year, on the urgent invitation of the Wesleys, he left England for Georgia, where he remained for nearly a year. He now returned to England in order to raise subscriptions for an orphan-house which he had established in Georgia, and commenced a series of preaching-tours in conjunction with Wesley, the result of which was the formation of the Methodists into a separate and powerful sect. In 1739 he again visited America, remaining for nearly two years. In 1741 the two leaders quarrelled on the question of predestination, Wesley declaring for Arminianism and W. for the Calvinistic dogma of irresistible fate and eternal election and reprobation. In the same year W. visited Scotland on the invitation of the Secession leaders Ralph and Ebenezer Erskine, whom, however, he soon offended by his blindness to petty differences and his readiness to preach in parish churches as well as in secession pulpits. In the October of 1741 he visited Wales, where he married a widow, with whom, however, he did not live happily, and whose death in 1768 'set his mind much at rest.' His supporters now built him a large 'Tabernacle' at Moorfields, where he attracted, as before, immense audiences. In 1744 he went again to America, and continued his preaching-tours, everywhere with the same effect. In 1758 he returned to London, and soon afterwards made a convert of Selina, Countess of Huntingdon, who made him her chaplain and extended his fame to the highest circles of rank and literature in London. Among his hearers were to be found Chesterfield, Bolingbroke, and Hume, and in America he was listened to with pleasure by Benjamin Franklin. W. was now at the height of his fame. His audiences were numbered by tens of thousands, and his preaching was marked to a large extent by more than momentary effects. Though much of his labour was wasted in awakening the multitude to a sense of the wickedness of fictitious crimes, yet valuable ethical results followed also. Franklin bears witness to 'the change made in the manners of our inhabitants.' W. set out on his seventh visit to America in 1769, and died suddenly, soon after his arrival, at Newberry, near Boston, September 30, 1770. From an account-book in which he entered his 'collections,' it appears that he preached upwards of 18,000 sermons to 10,000,000 of people. From the writings he has left behind him it is impossible to understand the marvellous effect of his preaching. With no ideas whatever, and with but a limited stock of Biblical phrases, his sermons told upon his audiences like a succession of electrical shocks. In the words of his latest biographer, 'his theological learning was comparatively small; he had no genius, no poetry, no profundity of thought, no embellishment of language, no dramatic illustration, and it may fairly be doubted if he ever understood the Calvinism which he preached,' and yet he has been perhaps the most powerful of English preachers. The intense energy of his convictions and the vehemence of his manner appear to have been the spell which overawed his auditors. 'What he says and does,' says Doddridge, 'comes but little short of an assumption of inspiration or infallibility.' He owed everything to the peculiarity and novelty of his manner, and the dictum of Dr. Johnson must be allowed to stand, that here 'familiarity and noise claimed the praise due to knowledge, art, and elegance.' A collection of his sermons and letters was published the year after his death, *The Works of Rev. G. W.* (6 vols. Lond. 1771), and his *Memoirs* by Dr. Gillies (1772). See *The Life of the Rev. G. W., B.A., of Pembroke College, Oxford*, by the Rev. L. Tyerman (2 vols. Lond. 1876).

White'fish (*Coregonus albus*), a species of Teleostean fishes, belonging to the family *Salmonidæ*, and occurring in the rivers and lakes of N. America. The W. belongs to the same genus as the Vendace (q. v.), pollan, &c. The average length is 2 feet, and the colour a bluish grey above and white beneath. It may attain a weight of 10 lbs., and has a long body and a pointed muzzle. The mouth is toothless. It is caught in winter by means of nets and also by spearing. The W. is largely eaten by the Indians, both in a fresh and salted state. After boiling, the flesh is white and pale. Lake Champlain appears to be the most southern limit of distribution of this fish: an allied species (*C. Otsego*) inhabits the lake of that name.

White Gun'powder, a white explosive mixture, invented by Augendre and composed of chlorate of potash (2 parts), loaf-sugar and ferrocyanide of potassium (each 1 part), separately pulverised and mixed dry. W. G. has very great explosive power and is readily inflamed, but a liability to explode from a shock or friction and other disadvantages unfit it for practical use.

Whitehall, a village of New York, U. S., at the S. end of Lake Champlain, 70 miles N. of Troy by rail. It has 5 churches, 4 banks, 2 newspapers, and an opera-house. There are 9 timber yards, 8 ship-yards, saw and flour mills, machine and carpet factories. Pop. (1870) 4322. Settled by Major Philip Skene in 1761, it became a military depot in 1812, and has since been important for transport trade.

Whiteha'ven, an important mining centre and seaport of Cumberland, England, is situated on a level inlet between precipitous cliffs, 38 miles S.W. of Carlisle, and 10 miles from Workington by the W. and Workington Railway, through which it is brought into direct communication with London and other parts of England. The town contains numerous churches belonging to the various Protestant denominations, of which the latest (built by the Congregationalists, 1875) has a fine Gothic spire 110 feet high, several schools, a mechanics institute, a library, public baths, &c. There are manufactures of coarse cloth, earthenware, soap, &c., but the prosperity of the town is chiefly due to the immense seams of coal and of hæmatite iron ore in its vicinity, some of which are wrought a distance of two miles under the sea. There are also large rope-works and shipbuilding yards (32 British vessels of 26,652 tons during 1874–78), and regular steamboat communication with Liverpool, Belfast, Dublin, and the Isle of Man. The port (improved by the opening of a new wet dock in 1876) was entered in 1878 by 1632 vessels of 200,679 tons, and cleared by 1646 of 205,723 tons; and on December 31st of same year had 134 ships on its register, besides 59 fishing-boats. In 1877 the imports amounted to £80,545, and the exports to £72,622. W. publishes five weekly newspapers, and returns one member to Parliament. Pop. (1871) 18,451.

White'locke, Bul'strode, born in London, 2d August 1605, from Merchant Taylors' passed to St. John's College, Oxford, and thence degreeless to the Middle Temple. Returned to the Long Parliament of 1640, he acted as chairman of the committee for drawing up Strafford's charges of impeachment, and was one of the commissioners appointed to treat with the king at Oxford; but during the Troubles he steered a uniformly middle course, as member of the Westminster Assembly (1643) opposing the adoption of Presbyterianism, as governor of Windsor (1644) saving the royal library and cabinet of medals from dispersion, and as a commissioner of the Great Seal (1649) withholding his consent to Charles's death. Ambassador to Sweden (1653), he concluded a treaty with Queen Christina, and by her was made knight of the order of Amartha, on his return becoming a commissioner of the Treasury (1655), Speaker of the House of Commons (1656), and one of Cromwell's lords (1657). He helped, however, to dethrone the Protector's son, and after the Restoration lived unmolested at Chilton Park, his Wiltshire seat, where he died, 28th January 1676. From his MSS. have been published *Memorials of English Affairs from the beginning of the Reign of Charles I. to the Restoration* (1682, new ed. 4 vols. Oxf. 1852); *Memorials of English Affairs from Brute to the end of the Reign of James I.* (1709), *Journal of the Swedish Embassy* (1772, new ed. 2 vols. 1845), and other works.

White Mountains, a mountain-range of Maine and New Hampshire, U.S., belonging to the Appalachian system, and covering a total area of 800 sq. miles. The chief summits are Mount Washington (6288 feet), Mount Jefferson (5794 feet), Mount Adams (5714 feet), Mount Madison (5363 feet), Mount Pleasant (4712 feet), &c. The W. M. are much frequented by

tourists on account of their wild and beautiful scenery, which has won for the region the name of the 'Switzerland of America.' Here rise the head-waters of the Connecticut and Merrimack rivers. The engineering marvels are numerous, the chief being the railway which climbs up Mount Washington to the hotel on its summit.

White River rises in the Ozark Mountains on the borders of Arkansas and the Cherokee Territory, flows N.E. into Missouri to Forsyth, then S.E. through Arkansas, and having been joined by the Big Black River at Elizabeth, falls into the Mississippi 15 miles above the mouth of the Arkansas River. It is navigable to Batesville, 380 miles from its mouth, and is in all 900 miles long.

White Sea (Russ. *Byeloye More*), a branch of the Arctic Ocean which extends S.W. into the government of Archangel as far as the 64th parallel. It is separated from the open sea by the peninsula of Kola and a strait 246 miles long, and from 106 miles (between Capes Sviatoi and Kanin) to 28 wide, and divides itself for the most part into three bays, of which the broadest is the Dwina Bay to the S.E., the southmost the Onega Bay, and the longest the Kandalak Bay in the W. Its area, including the N.E. bay, into which the Mezen falls, is 47,346 sq. miles. The coasts are flat, with numerous lakes, small rivers, and mountains in the N. and E. The W. S. is blocked with ice except during the months of June, July, and August. Canals connect it with the Volga and the Dnieper. The dwellers on its shores are Lapps, Finns, and Samoyedes, who live by fishing, seal-hunting, and the chase. The chief port is Archangel (q. v.). The passage to the W. S. was discovered in 1553 by Richard Chancellor, an officer under Sir Hugh Willoughby. The English in 1584 established the little fort of Archangel as the centre of the W. S. trade, in which they enjoyed great privileges till the founding of St. Petersburg.

White Sul'phur Springs, a favourite summer resort for the inhabitants of the United States, America, on the Chesapeake and Ohio Railway, 227 miles W. of Richmond, in Greenbrier county, W. Virginia. Its medicinal spring, known since 1778, attracts annually great numbers of visitors. In the vicinity are the Red, Salt, and Blue Sulphur Springs, all containing sulphates of lime, soda, magnesia, &c.

White'throat, the name given to various species of Warblers. The Common W. (*Sylvia undata*) and the Garden W. (*S. hortensis*) are familiar examples. The former attains a length of 5 inches, and is of a reddish-brown colour above and brownish white below, the throat being pure white. The Garden W. has the abdomen pure white. The average length is 6 inches. The Lesser W. (*Sylvia curruca*) is dark grey above, and white below. Its length is 5 inches. The food of the W. consists of berries and seeds, and the song is sweet and clear.

White'wash consists of common lime or *whiting* mixed with water to a milky consistency, size being sometimes added. It is used for coating walls and ceilings of stone, brick, or woodwork, and is a valuable sanitary agent.

Whitgift, John, a merchant's son, was born at Great Grimsby, Lincolnshire, in 1530, and educated in London at St. Anthony's school. Trained as a child in Reformation principles by his father's brother, Abbot Robert of Wellow, he matriculated at Queen's College, Cambridge (1549), but speedily migrated to Pembroke Hall, then governed and taught by three famous Protestants—Ridley, John Bradford, and Edmund Grindal. Their patronage brought him a scholarship and Bible-clerkship, and in 1555 he was chosen a fellow of Peter House, whose master sheltered him through Mary's reign. At length Elizabeth's accession permitted his ordination to the Cambridgeshire rectory of Teversham (1560), and under the new *régime* his rise was rapid. As Lady Margaret's professor of divinity (1563), he took for his first text, 'The Pope is Antichrist;' in 1567 he was elected master of Pembroke, in 1570 of Trinity College. Elizabeth herself commended a sermon by styling him her 'white-gift' and by a royal chaplaincy; thanks to her favour, he rose to be prolocutor of Convocation (1572), Dean of Lincoln (1573), Bishop of Worcester and Vice-president of Wales (1576), and Grindal's successor in the archbishopric of Canterbury (1583). Though leaning himself to moderate Calvinism, he zealously upheld the spiritual despotism of the Crown, wielding impartially the terrors of the Ecclesiastical Commission against both Puritans and Catholics. He, the assailant of Cartwright (q.v.) and the assailed in the great 'Mar-prelate' controversy, strove to force Calvinistic supralapsarianism on the Church by his Lambeth Articles (1595), but weakly withdrew them so soon as their tenets appeared obnoxious to Burleigh and the Queen. To the same weakness his rigour may be justly imputed, for personally W. was the reverse of cruel, being a generous patron of learning, and as munificent in his charities as he was princely in his hospitality. The death of Elizabeth was a grievous shock to the archbishop, but alarm concerning her successor's orthodoxy did not prevent his receiving James with fulsome flattery, and his fears were soon calmed by the Hampton Court Conference (q. v.), at which he was present but took no prominent part. Next month he died at Lambeth, 29th February 1604. From his ninety-one MS. and printed productions the Parker Society has issued a selection, edited by the Rev. John Ayre, and including the *Answer to a certain Libel, entituled an Admonition to Parliament* (1572) and the *Defense of the Answere to the Admonition against the Reply of Thomas Cartwight* (1574), two vigorous polemics, where personal ridicule seasons blunt accuracy of style. See Sir George Paule's *Life of W.*, reprinted in Wordsworth's *Ecclesiastical Biography* (vol. iii. 1809), and Dean Hook's *Lives of the Archbishops of Canterbury* (vol. v. new series, Lond. 1875).

Whi'ting is a term applied to ground and elutriated chalk, which is employed as a pigment in size-painting, for cleaning plate, and for other purposes.

Whi'ting (*Merlangus vulgaris*), a species of Teleostean fish belonging to the *Gadidæ* or Cod family. It is destitute of a barbule or tentacle borne on the lower jaw, seen in the cod and haddock, is smaller than the haddock, and of a more elegant shape. The W. is fished on British coasts, the average weight being from 1 to 2 lbs. The body is compressed, and the upper jaw projects beyond the lower. The scales are small, and the dorsal fins number three. There are two anal fins. The colour is a greenish yellow above and silvery white beneath. A black patch occurs at the base of the pectoral fin. The fish is delicate and palatable. An allied species, Couch's W. (*M. albus*), is captured on the British coasts, but seems to be a native of the Mediterranean Sea.

Whit'low, or **Parony'chia**, is inflammation in, or in the neighbourhood of, the sheath of one of the flexor tendons of the fingers. There are various forms of this disease, the common W. consisting usually of a collection of a purulent fluid between the skin and epidermis, and requiring nothing more than the division of the epidermis, followed by plain water-dressing. In other and more severe cases the abscess forms beneath the skin, and should be opened early. When there is acute inflammation inside the sheath of the tendon, the disease is called *periosteal* W., and the disease being a very serious one, prompt and skilful treatment is necessary, otherwise a finger or the hand may be lost. The first symptoms are intense pain generally in the middle phalanx of the finger, with slight swelling and redness. The part is exquisitely tender, and fluctuation can seldom be felt at the early stage of the formation of matter, owing to the tenseness of the part. A free and deep incision in the middle line of the finger is urgently needed whether suppuration has or has not taken place, and this will afford immediate relief to the pain and tension. The incision is very painful, though momentary. The bleeding should be encouraged by putting the hand in warm water. A large poultice should afterwards be applied, and the hand should be elevated on to the opposite shoulder.

Whit'man, Walt, the 'Poet of Democracy,' born at West Hills, Long Island, May 31, 1819, was educated at Brooklyn and New York, and having from printer turned carpenter, from carpenter schoolmaster, made long journeys afoot through Canada and the States (1847-48). Editor for short periods of New Orleans and Huntingdon newspapers, he served as a volunteer nurse in the Washington and Virginian hospitals (1862-65), and held various Government clerkships at Washington till 1874, when, enfeebled by paralysis, he withdrew to Camden in New Jersey. On April 14, 1879, he made his début as a lecturer at New York, his subject being the 'Death of Lincoln.' 'Disorderly, fleshly, sensual' (to quote himself), he has achieved 'a literary

immortality' (to quote Mr. Robert Buchanan) by his *Leaves of Grass* (1855), *Drum-Taps* (1865), and *Two Rivulets* (1873). These 'poems,' devoted to the 'illumination of the Execrable,' resemble if aught a chaotic dictionary—no rhyming one, be it observed—with a few chance beautiful, more nasty terms, while 'as to their meaning it's what you please'—nonsense and filth to the ignorant vulgar, 'ineffable goodness and beneficence' to a few such 'golden eagles' as W. W. W. M. Rossetti has published an English edition of his *Poems* (Lond. 1868). See Bayne in the *Contemporary* (December 1875).—Wholly unconnected with the preceding save by identity of name, **Mrs. Sarah Helen W.** (*neé* Power) was born at Providence, Rhode Island, 19th January 1803, married at twenty-five a Boston lawyer, and left a widow (1833), died at her birthplace 27th June 1878. Her *Hours of Life and Other Poems* (1853), the *Fairy Ballads* (new ed. 1868), written conjointly with a sister, and *In Memoriam* (1878), commemorating that sister's loss, are full of melody and love of nature. The last-named work contains fifteen pieces addressed to Poe, her brief engagement to whom (1848) formed her one romance, and gave birth to her *Poe and his Critics* (1860), a little volume of passionate, lofty prose.

Whit'ney, Eli, an American inventor, was born at Westborough, Massachusetts, December 8, 1765, and graduated at Yale College in 1792. In Georgia, whither he went as a teacher, he devised a machine for cleaning seed-cotton. His invention, however, was stolen by others before he took out a patent. In 1795 he started a machine manufactory with a Mr. Millar, and was voted a sum of $50,000 by the legislature of S. Carolina for the invention of the cotton-gin. He subsequently turned his attention to the manufacture of firearms, supplying the Government according to contract from 1798, and ultimately amassing a large fortune at Whitneyville, Connecticut, a flourishing village which rose round his manufactory. He died at New Haven, January 8, 1825.

Whit'ney, William Dwight, born at Northampton, Massachusetts, 9th February 1827, after graduating at Williams College in 1845, held for some time a clerkship in a bank. Having, however, resumed his studies at Yale College (1849), he visited Europe, and at Berlin under Weber, at Tübingen under Roth, made Oriental languages, Sanskrit especially, the object of three years' investigation (1850-53); and returning home by way of Paris, London, and Oxford, became in 1854 professor of Sanskrit in Yale College, and of comparative philology in 1870. He has been besides a member of the American Oriental Society since 1849, its librarian (1855-73), and corresponding secretary since 1857, and was first president of the American Philological Association. W. has done in America what Max Müller has done in England, popularised the science of language; but as a staunch upholder of the *Thesei* theory of Language (q. v.) he has engaged in an unfortunate contest with the great German scholar; unfortunate because the powers of both combatants have lately been wasted on trivial points, where the difference is often less real than verbal. W. is a clear, logical, and suggestive writer; his works include *Language and its Study* (1867; Eng. ed. by R. Morris, 1876), a *German Grammar* (1869), *German Reader* (1873), *Oriental and Linguistic Studies* (2 vols. 1872-74), *The Life and Growth of Language* (1875), *Essentials of English Grammar* (1877), and a *German-English Dictionary* (1877), besides editions of the *Atharva Veda*, *Surya-Siddhânta*, *Tâittirîya-Prâtiçâkhya*, &c., and important contributions to Böhtlingk's *Sanskrit Dictionary*.

Whit'stable, a village in Kent, 58½ miles E. of London by the L. C. D. Railway, and about 6 miles N. of Canterbury (with which it is connected by a branch line), is celebrated on account of its oysters, reckoned the most delicate in the market, and of which one grower alone sends 50,000 bushels annually to London. A parish church, which dates from the 15th c., was restored in 1876. A causeway locally known as the street, seen some little distance off shore at low water, is thought to be a relic of the Romans. W. has breweries, rope-works, boat-building yards, &c. Pop. (1871) 5481.

Whit'sunday. See PENTECOST.

Whit'suntide is the week which follows Pentecost (q. v.) Sunday, or more strictly the Sunday, Monday, and Tuesday of that week.

Whitt'ier, John Greenleaf, an American poet, was born of a Quaker family at Haverhill, Massachusetts, December 17, 1807. He worked upon his father's farm, learning also the trade of shoemaking, and when eighteen years of age began to write verses for the *Haverhill Gazette*. He attended the Haverhill Academy (1827-29), and subsequently edited various abolitionist journals, and was for a time member of the Massachusetts Legislature and secretary of the Anti-Slavery Society. His poetry consists chiefly of fugitive pieces, of which numerous collections have been published. *Mogg Megone*, and *The Bridal of Pennacook*, both Indian legends, were published in 1836 and 1848 respectively. Besides these may be mentioned *Ballads* (1838), *Lays of my Home* (1843), *Voices of Freedom* (1849), *Songs of Labour* (1850), *The Chapel of the Hermits* (1853), *The Panorama* (1856), *Home Ballads* (1860), *In War Time* (1863), *Snow-Bound* (1866), *The Tent on the Beach* (1867), *Among the Hills* (1868), *Miriam* (1870), *The Pennsylvanian Pilgrim* (1872), *Mabel Martin* (1874), and *Hazel Blossoms* (1875), including the poems of his sister, Elizabeth H. W., who died in 1864. He wrote a hymn for the opening of the Philadelphia Exhibition, 1876, and in the same year a complete *Centennial Edition* of his poems was published in Boston. As a poet his characteristics are vigour, simplicity, and picturesqueness, combined with a lofty love of freedom and sense of right. His versification is now and then rather rugged, and his rhymes are apt to be slovenly, but on the whole he has an honourable place among the first half-dozen poets of America. His principal prose works are *Legends of New England* (Hartford 1831); a *Life of J. C. G. Brainerd* (Hartf. 1832); *Justice and Expediency* (Bost. 1833); *The Stranger in Lowell* (1845), *Supernaturalism in New England* (1847), *Leaves from Margaret Smith's Journal* (1849), *Old Portraits and Modern Sketches* (1850), and *Literary Recreations* (1854). His *Poems*, complete up to that date, were published in London in 1874.

Whitt'ington, Sir Richard, born about 1350 at Pauntley, Gloucestershire, in 1370 lost his father, lord of the manor of Pauntley, and coming afoot to London (so runs the nursery tale), became apprentice to a merchant there. How in his flight from the cook's cruelty he was stayed at Highgate by Bow Bells' chime, and how from the sale of his cat in catless Africa he ended by wedding his master's daughter, are household words. Facts not so widely known are that he really was thrice Lord Mayor, in 1397, 1406, and 1419; that he made large loans to Kings Henry IV. and V., and purchased abroad the trousseaux of Princesses Blanche and Philippa (the invoices still exist); and that, dying in 1425, he devoted his estate to the founding of Guildhall and Grey Friars libraries, the rebuilding of Newgate, the repair of St. Bartholomew's, and similar purposes. In his lifetime, too, he shared in the expense of rebuilding the nave of Westminster Abbey, and caused to be compiled a sort of London Directory, the quaint and valuable *Liber Albus* (1419, translated and annotated by Mr. Riley, Lond. 1859). Mr. Lyson, in his *Model Merchant of the Middle Ages* (Lond. 1860), has fully vindicated W.'s historic character, but he probably goes too far in accepting the 'interesting story,' which Riley accounts for thus—that, in the 14th c., the Fr. word *achat*, 'trading,' was in England written and pronounced *acat*, and that to *a cat* of this nature W. owed his wealth. The explanation is ingenious, but the same tale is told in lands the most remote, even in Persia, and does not seem to have attached itself to W.'s name until the close of the 16th c. See a long discussion of the subject in the 2d series of *Notes and Queries*. A Life of W. by F. Rice is announced (1879) to appear in Ward's 'New Plutarch Series.'

Whitt'lesea or **Whitt'lesey**, a decayed town in Cambridgeshire, 6 miles S.S.E. of Peterborough, with a pop. (1871) of 4297. About 5 miles to the S.W. there formerly existed, over what is now a fertile and richly cultivated tract, a shallow lake, called Whittlesea-mere, which was 2 miles long by 1 broad.

Whit'worth, Sir Joseph, Bart., F.R.S., a well-known mechanician, was born at Stockport in 1803. At the Great Exhibition of 1851 he exhibited a number of improved tools and machines; and a few years later turned his attention to the construction of projectiles and firearms of great range and accuracy. In this department he has gained a high reputation; and for his services in perfecting military armaments he was created a baronet in 1869. The same year he founded the Whitworth Scholar-

ships for the encouragement of engineering science. These consist of 30 scholarships of £100 a year each, and tenable for two or three years. In 1878 he received from the University of Edinburgh the degree of LL.D. He has published *Miscellaneous Papers on Practical Subjects; Guns and Steel* (1873).

Whor'tleberry (a corruption of 'myrtle-berry,' the two fruits being much alike) is a name originally applied to *Vaccinium myrtillus*, but is now used with generic application. *Vaccinium* is the type of the sub-order *Vaccinieæ*, of the natural order *Ericaceæ*, and consists of upwards of 100 species of shrubs with alternate, often evergreen leaves; solitary or racemose white or red flowers; calyx tube 4-5 toothed; corolla urceolate or campanulate 4-5 fid; stamens 8-10, epigynous; ovary 4-5 celled; style filiform, with an obtuse stigma; fruit a berry. The distribution is through Europe and temperate and subtropical Asia and America. The common W. or Bilberry (*V. myrtillus*) is a common plant of heaths and copses in the British Isles, ascending to 4200 feet. It produces a dark-blue glaucous berry about the size of a pea, which is used to a considerable extent for preserves and tarts, and it is a favourite food with grouse. It can also be used as a dye, and the whole plant contains quina acid. *V. Vitis idæa* (sometimes called cowberry) is a procumbent shrub of high moorlands, has evergreen box-like leaves, and produces a red acid berry used for jellies and preserves. The leaves of *V. arctostaphylos*, a shrub of the neighbourhood of the Black Sea, and abundant on the flanks of Olympus, are collected and used in lieu of tea, being sold under the name of 'Broussa tea.' Some American species of the genus are called Huckleberry, the best known being *V. corymbosum* (the swamp blueberry), which bears sweetish bluish-black berries, and *V. Pennsylvanicum*, yielding an abundance of berries in colour and taste similar to the above. Several species of W. are grown in gardens as ornamental shrubs.

Whyd'ah, or **Whyd'aw**, the chief port of the West African kingdom of Dahomey, and capital of a province of the same name. It is situated on a large lagoon, two miles inland, and has an extensive trade in palm-oil, ivory, salt, and gold dust. W. was formerly a chief centre of the slave-trade, and had a pop. of 50,000, which has decreased to 12,000 since the abolition of the traffic.

Whyte-Melville, George John, son of a Fifeshire laird, born near St. Andrews in 1821, was educated at Eton, and entering the army at eighteen, retired after ten years' service, having risen to be captain in the Coldstream Guards (1846). On the outbreak, however, of the Crimean War, he joined the cavalry of the Turkish contingent, and during 1855-56 gained the experiences embodied in the *Interpreter* (1858). This was the fourth of some twenty novels, which, whether sporting, historical, or 'costume,' have all a cleverness and dash that make them popular, among them being *Digby Grand* (1853), *General Bounce* (1854), *Kate Coventry* (1856), *Holmby House* (1860), *The Gladiators* (1863), *Cerise* (1865), *Sarchedon* (1871), *Katafelto* (1875), and *Black but Comely* (1879). He who so well described a good run with the hounds, met his death in the Gloucestershire hunting-field, 5th December 1878.

Wich'ern, Johann Heinrich, a German philanthropist and founder of the 'Inner Mission,' born at Hamburg, 21st April 1808, studied first at the *Johanneum* of that city, then as a student of theology at Göttingen and Berlin, received a benefice in his native town, and gave himself up to earnest practical endeavours to improve the condition of the poor, the suffering, and the lost. In the *Rauhes Haus* (founded 1st November 1833) he established an institution for neglected children, with which a training seminary for teachers was also joined. Institutions on a similar plan were shortly afterwards formed throughout Germany and in several other European countries. In September 1848 he succeeded in forming a central union for the 'Inner Mission,' an association which converted into one regular system 'the whole of the activity for the poor, the sick, the fallen, and those strange to religious and moral influences.' In 1856 he was appointed councillor of the Prussian ministry of the interior, and a member of the higher church council. W.'s writings are entirely of a practical character. The chief is *Die Innere Mission der deutsch-evangelischen Kirche* (Hamb. 1849).

Wick (the town on the *wic* (Scand. *vig*) or 'bay'), the county town of Caithness, and the chief seat of the herring fishery in Scotland, on W. Bay, at the influx of W. Water into the North Sea, 161¼ miles of Inverness by rail. It is divided into three parts—W. proper, the oldest part of the town, Louisburgh, and Pulteneytown, on the S. side of the river, the seat of the manufactures, commerce, and fisheries. Two suburban villages are Staxigo and Boathaven. Pulteneytown is open and well built, its streets radiating in different directions from a large central square. It was founded by the British Fisheries Society in 1808. A new harbour is now (1879) being formed at a cost of £120,000, with a depth at the entrance of 30 feet. There are two harbours, not deep enough, however, for large vessels, while during easterly winds the swell in the bay makes the roadstead one of the most dangerous on the E. coast. W. has distilleries, a brewery, steam saw-mills, rope and sail-cloth factories, and an iron-foundry. Boat-building and the manufacture of barrels and netting are actively carried on. During the herring season (July to September) the population is largely increased, and both land and water present an animated spectacle. The gross annual value of herrings exported is from £150,000 to £200,000. Trade has been considerably developed since the opening of the railway (1874) connecting W. and Thurso with the South. Steamboats ply weekly to Kirkwall, Aberdeen, and Granton. In 1878 there entered the port 1248 vessels of 148,749 tons, and cleared 1222 of 136,233 tons; and on December 31 of the same year there belonged to the port 78 vessels of 8090 tons, besides 1101 fishing-boats manned by 1485 hands. W. unites with Kirkwall, Dornoch, Dingwall, Tain, and Cromarty in returning a member to Parliament. Pop. (1871) 8131.

Wick (Old Eng. *weoca*, primarily a 'bunch'), a number of twisted or plaited cotton threads placed in a lamp or candle to lead up by capillary action the oil or other fatty material to be burned. Wicks are treated with borax or ammonic or bismuth salts to render them less combustible, and the necessity for snuffing or removing charred portions of the W. is obviated in several ways, the simplest of which, applied to stearine candles, consists in plaiting the W. flat, so that it curves over as it burns.

Wick'low, a maritime county of the province of Leinster, Ireland, is bounded N. by Dublin, E. by St. George's Channel, S. by Wexford, and W. by Carlow and Kildare. Area 500,178 acres; pop. (1851) 98,978, (1871) 78,697, a decrease due to the emigration of 19,697 persons during 1851-77. With a steep and dangerous sea-board, W. is inland extremely mountainous, having fifteen summits exceeding 2000 feet of elevation, the loftiest of them Lugnaquilla (3039 feet). The wooded glens, the tarns, and torrents with brawling waterfalls make W. singularly picturesque, but its water area is only 1090 acres, and except that the Slaney and Liffey rise within its borders, the Avoca is its only considerable stream. Of granitic formation, W. is richer than most Irish counties in minerals, the yield in 1877 being 16,725 tons of iron pyrites, 1655 tons of lead ore, 6205 oz. of silver, and 2618 tons of copper ore. The climate resembles that of Wexford (q. v.); the soil in the lowlands is fairly fertile. Of 110,932 acres under crops in 1878 (118,002 in 1853) 3979 were in wheat, 24,770 in oats, 1530 in barley, bere, and rye, 11,150 in potatoes, 5886 in turnips, and 61,033 in meadow and clover, while woods and plantations covered 19,169 acres in 1877. The live stock included 12,183 horses and mules, 3532 asses, 77,804 cattle, 199,452 sheep, and 24,555 pigs in 1878, when the rateable valuation was £271,552. The population is mainly agricultural and Catholic, Protestants numbering 15,305 in 1871; and of the total 28·1 were illiterate, though W. had then 186 schools. Arklow, Wicklow, and Bray are the only towns in the county, which returns two members to Parliament. Among its many antiquities the most famous are the 'Seven Churches' of Glendalough, said to have been founded by St. Kevin (6th c.), and including a 'round tower,' 110 feet high.

Wick'low, a market and seaport town of Ireland, the capital of the county of the same name, lies on the estuary of the Vartrey (called 'Brom Lough'), 28¾ miles S.S.E. of Dublin by rail. It has a church with a tower of 1777, a Catholic chapel, Quaker and Wesleyan Methodist meeting-houses, and one weekly newspaper. Chartered in 1614, W. before the union sent two members to the Irish Parliament. Pop. (1871) 3164.

Wic'lif, or **Wyc'liffe** (the name is spelt in a variety of ways), a great English reformer of the 14th c., was born probably at the village of Spresswall, about half a mile from the

manor-house of the family to which he belonged, and not far from Old Richmond in Yorkshire. The date of his birth may be supposed to fall between 1315 and 1320, the year 1324 assigned by Lewis and accepted by several subsequent biographers being too late to tally with other facts in his life. Of his childhood and youth no account has been preserved. He probably came up to Oxford when a mere lad, and he certainly had a remarkable university career; but all details are wanting till 1356, when we find him (if there is not a confusion with another John W.) seneschal of Merton College. In 1361 he was master or warden of Balliol, and though in May of the same year he was appointed rector of Fillingham in Lincoln, the university continued for a long time the main seat of his activity. About four years later, Simon Islip, Archbishop of Canterbury, appointed W. (if this be not again the other Wycliffe) warden of the new foundation of Canterbury Hall, but after Islip's death he was expelled by the monkish members, whose action was sanctioned by papal bull in 1370 and confirmed by royal decree in 1372. Meanwhile W. had become professor (*i.e.*, doctor) of theology. Lechler thinks it not improbable that he was a member of the famous Parliament of 1366, and at any rate he wrote about this time a tractate or dialogue in defence of the national policy towards the Pope. In 1374 he was one of the commissioners sent to Bruges to arrange a concordat, and about the same time he received from the king himself (Edward III.) the rectory of Lutterworth in Leicestershire. With Edward's younger son, John of Gaunt, Duke of Lancaster, he was in special favour; but this very favour was probably the proximate cause of the first hostile action of the clergy. Summoned before Convocation in 1377, he was saved from all danger by the high-handed protection of the Duke of Lancaster and his friends, who made their way into the assembly and rendered all judicial proceeding impossible; and though in the following year a formidable process was instituted against him by direct command of Gregory XI., the papal commissioners were induced by the intercession of the Princess Joanna and the evident sympathy of the citizens to do no more than forbid him further to disseminate his obnoxious doctrines. But in the course of the following years W. grew more and more estranged from the orthodox creed, and his endeavours to propagate his opinions were of wider scope than before. In 1378 the election first of Urban VI. and then of Clement VII. produced a schism in the Church: each pope condemned his rival as antipope, and W. declared that they were both right, and that the papacy was Antichrist. He called in question the doctrine of transubstantiation, and declared that pilgrimages and monastic vows had no authority from Scripture. And his views were accepted by numerous disciples, and disseminated by preachers through the length and breadth of the land. The ecclesiastical authorities endeavoured to suppress the movement by fair means and foul; but though many of its leaders were silenced, the great originator of the whole continued to the end boldly to bear witness to the truth. He died in peace at Lutterworth, on Sylvester's day, 31st December 1384. The importance of his life work may be read in the religious history of Europe during the 15th and 16th centuries. In England the Lollards, as his followers were called, were driven gradually into the background, but their doctrines were taken up on the Continent by Huss, and continued potent in many ways till they were absorbed in the larger wave of the great Reformation. W. was a man of powerful intellect and philosophic subtlety; uniting a fondness for scholastic speculation and argument with a rare power of appealing simply and effectively to common sense. Wit, humour, and sarcasm abound in his pages. It is not probable that the popular view of W.'s character and position will be seriously modified, but it should be known that a less favourable opinion than the one just expressed has been pronounced by many competent critics. He had a way of minimising his heresies when under examination, and of fortifying himself when in danger with the sword of the civil magistrate, or rather of the 'lords temporal,' that shows a prudent but not a heroic temper. Insisting that every priest should imitate the poverty of his Divine Master, he himself was a pluralist for the greater part of his life.

According to Shirley, his Latin works are 96 in number and his English 65. The latter, of which Arnold recognises only 41 as genuine, are for the most part of the pamphlet type; but among the former there are twelve or thirteen large treatises. A great proportion of the whole are still in MS. It is enough to mention his *Trialogus*, published by Lechler (Oxf. 1869), *De Officio pastorali* (also ed. by Lechler, Leip. 1863), *De Dominio divino* (MSS.), *De Dominio civile* (MS.), and *W.'s Wicket, or a Treatise on the Sacrament* (Oxf. 1612). Thomas Arnold has edited *Select English Works of John W.* (3 vols. Lond. 1869–71). W.'s greatest contribution, however, to English literature was his translation of the New Testament from the Vulgate, which is nearly as remarkable in point of language as the later version of Tyndale. The first edition was printed by Lewis (Lond. 1731). The best edition is Forshall and Madden's *The Holy Bible .... by J. W. and his Followers* (4 vols. Oxf. 1850). See the Rev. Dr. Shirley's *Fasciculi Zizaniorum Magistri Johannis Wyclif* (published 1858 by the Master of the Rolls), the Lives of W. by Lewis (Oxf. 1820), Tytler (Edinb. 1826), Vaughan (Lond. 1828 and 1853), and Lechler (Leip. 1873; Eng. trans., with 'additional notes' by Professor Lorimer, D.D. (Lond. 1878).

Widd'in, a town and fortress of Bulgaria, on the right bank of the Danube, opposite the village of Kalafat, 18½ miles from the Servian frontier, and 130 miles E.S.E. of Belgrade. It is the seat of a Greek bishop, and has an important citadel greatly strengthened since 1853–54, built on a low hill, and surrounded with a double circumvallation with four gates to the landside and five to the river. The difficulty of attacking the fortress is greatly increased by the flat, swampy character of the ground. There are in W. 1730 bazaar-booths, 3 barracks, and 2 hospitals. It manufactures gold and silver filigree and saddles, and has considerable fishery, and trade in rock-salt, corn, wine, and agricultural products. The merchants are principally Jews and Bulgarians. Pop. 25,000–30,000 (the majority Mohammedans). W. is the *Bononia* of the Romans. In 1801 it was the scene of the defeat of the Hospodar Michael Sutsos by Paswan Oglu, and here in October 1853 Omer Pasha began the hostilities against Russia by crossing the Danube and occupying Kalafat, whereafter ensued several battles in the neighbourhood between the Turks and Russians, the chief on the 6th and 19th April 1854. In the war of 1877–78 W. was occupied by 10,000 Turks. Osman Pasha was commandant, and it was from W. he made his unexpected march to Plevna—the scene of his early victories and his heroic defence. By the Berlin Treaty of 13th July 1878 it now belongs to the new principality of Bulgaria.

Wid'geon, or **Wi'geon** (*Mareca*), a species of *Natatorial* birds, allied to the *Anatidæ* or ducks, which migrate southwards to Britain in September and October, leaving that country in their northward flight in April. Some few specimens may breed in the N. of Scotland. The common W. (*M. Penelope*) is about 18 inches in length. The male is white on the top of the head, and chocolate brown on the cheeks and back of the neck. The back is greyish, marked with finely-pencilled lines of black, and the wing-coverts are white, with black tips. The breast is brown, and the under parts white. The tail is long, black, and pointed. The female is of a brown hue. At the close of the breeding season, the tints of the male assimilate to those of the female. The nest is built amid reeds and rushes, and the eggs, which are small, are creamy-white in colour, and from five to eight in number. The flesh of the W. is highly esteemed. An allied species is the American W. (*Moreca Americana*), which attains a length of 22 inches, and is common in winter in the United States. Occasionally it has been found in Britain.

Widow, in law. See GOODS IN COMMUNION, and JUS RELICTÆ.

Wie'demann, Gustav Heinrich, a German physicist, was born October 2, 1826, at Berlin, where he studied medicine and the natural sciences, devoting himself especially to physics, of which he became professor at Basel in 1854. After spending some years at the Polytechnicum in Karlsruhe he was elected professor of physics at Leipzig in 1870, which chair he still (1879) holds. W. has contributed numerous papers on electrical and magnetic subjects to Poggendorff's *Annalen* and other scientific publications, but he is best known as the author of *Die Lehre vom Galvanismus und Elektromagnetismus* (2 vols. 1861, 2d ed. 1872–74), unquestionably the most complete and trustworthy treatise on the subject, not the least valuable feature of which is the system of giving complete references to the various authorities and papers quoted. In 1877 he succeeded Poggendorff as editor of the *Annalen der Physik und Chemie*.

Wie'land, Christoph Martin, one of the greatest of

German authors, was born 5th September 1733, at Oberholzheim, a small village in Swabia, where his father was pastor. He studied at Tübingen (1750–52), lived in the house of the poet Bodmer near Zürich for two years, spent some time in Zürich, then went to Biberach to fill a municipal office (1760), was appointed professor of philosophy at Erfurt (1769), and called (1772) to Weimar by the Duchess Anna Amalie to superintend the education of her two sons. That town was already the intellectual capital of Germany; and when, a few years after, Herder and Goethe went to reside there, it might almost have been called the Athens of Europe. W. spent the rest of a long life on terms of intimate friendship with those illustrious men whom a liberal and enlightened policy had collected at Weimar. He died 20th January 1813. W. was a very voluminous writer. His literary activity falls naturally into three periods—the first ends with his removal to Biberach; the second comprises his residence there and at Erfurt; the third, his residence at Weimar. The chief writings of the first period are *Zwölf moralische Briefe in Versen* (Halle 1752), *Anti-Ovid* (Amsterd. 1752), *Der geprüfte Abraham* (Zür. 1753), *Hymnen* (Zür. 1754), *Empfindungen eines Christen* (Zür. 1755). The characteristics of these works are severe asceticism and strong pietistic feeling, both carried to unnatural excess. To the second period belong *Agathon* (Frank. 1766), *Don Silvio von Rosalva* (Ulm 1764), *Musarion* (Leip. 1768), *Combabus* and *Die Grazien* (Leip. 1770), *Der neue Amadis* (Leip. 1771), and *Der Goldene Spiegel* (Leip. 1772). These show a complete revolution in the thoughts and feelings of the author. This we must ascribe to a natural reaction from the overstrained sentiments of his early years, a disappointment in love, and the influence of new circumstances on an extremely susceptible nature. They are marked by the exaltation of the senses over the mind, a gay Epicureanism, and an easy and occasionally loose morality. To the third period belong *Die Geschichte der Abderiten* (Leip. 1781; trans. by Christmas, 2 vols. Lond. 1861), *Oberon* (Weim. 1781; trans. by Sotheby, 2 vols. 3d ed. Lond. 1826; another ed. 1844); *Auserlesene Gedichte* (Jena 1784–87), containing some of his finest work. In addition, W. edited and wrote for several periodicals, and executed translations of Shakespeare (8 vols. 1762–66), Horace (*Epistles and Satires*, 1782–86), and Lucian (1788). Of W.'s third period it may be remarked that the moral tone is decidedly higher than in the second, while it is also free from the unrestrained extravagance of the first. To this period belongs his greatest work, *Oberon*. The plot of this poem is indeed eminently ridiculous, but the charming manner in which it is developed makes us forgive or forget its absurdities. It comprehends a vast variety of scenes and incidents, and all are treated in a pleasing and lively manner. Human emotions are described with truth and effect. The effect of the collision of counteracting passions, desires, and interests is portrayed with skill and power. Of W. it has been well said that 'once within his magic circle we forget everything else.' His touch, light and airy as it seems, is yet powerful and true; his style is easy, lively, and natural; the sentiments even of his most dangerous writings show that his intellect may sometimes have erred, his heart never did. He is almost the first great name in modern German literature; and when it is remembered who were his successors, it is no stinted measure of praise deliberately to pronounce him worthy of his place. A new edition of W.'s collected writings by Gruber was published at Leipzig (50 vols. 1818–28; new ed. 36 vols., 1839–40), and again (Stuttgart; 36 vols. 1851–56). See also his Life by Gruber (2 vols. Altenb. 1815–16; new ed. 4 vols., Leip. 1827–28); *W.'s Ausgewählte Briefe* (4 vols. Zür. 1815), *Briefe zu Sophie La Roche* (Berl. 1820), Löbell, *Christoph Martin W.* (Brunsw. 1858), Ofterdinger's *W., &c.* (Heidelb. 1877).

Wielicz'ka, a small town in Galicia, Austria, 9 miles S.E. of Cracow by rail, famous for its wonderful salt mines, which have been continuously worked since 1250. They consist of 7 different levels, or storeys, one above the other, connected by intricate passages and flights of steps, and in some places by lofty bridges, measure from E. to W. 12,468 feet, from N. to S. 3117 feet, and reach their greatest depth at 918 feet. The annual production of salt up to 1872 was 37,000 tons, but since that date it has gone down to 30,000 tons, and the number of workmen to 600. Several of the disused galleries have been adorned with statues hewn in the rock-salt, and two chapels have been excavated, in the larger of which the Mass is celebrated annually on July 3. The chapels were injured by the inundation of 1868. Pop. (1869) 6127.

Wiesba'den (Ger. the 'meadow baths'), a town of Prussia, province of Hessen-Nassau, until 1866 capital of the independent duchy of Nassau, lies on the S.W. spurs of the Taunus Mountains, 377 feet above the sea, 6 miles W. of Mainz by rail. It is well built, and contains a large number of splendid hotels. The chief buildings are the Gothic Protestant church (1853–62), a noble edifice with 5 lofty towers, containing colossal marble statues of Christ and the four Evangelists; the Roman Catholic church (1844–49), in the Romanesque style; the English church (1863–65); the new synagogue, in the Oriental style; the Schloss (1837–40); the museum, with a picture-gallery, a collection of antiquities, a natural history collection, and a library of 70,000 vols.; the Pauline palace (1842), in the Moorish style; the government buildings (1842), in the Florentine palatial style; the Greek chapel, erected by the Duke of Nassau as a mausoleum for his first wife, Elizabeth Michailowna; and the Kursaal, the principal resort of visitors, the largest hall of which is 132 feet long, 60 feet wide, and 48 feet high. Connected with the Kursaal by a long iron Trinkhalle is the Kochbrunnen, the principal of the 22 medicinal springs of W. Its waters have a temperature of 156° F. The second spring is that in the garden of the Adler Hôtel, 147° F. W. is one of the most frequented spas in Europe. In 1872 it was visited by upwards of 60,000 patients and travellers. Pop. (1875) 43,674 (14,000 Catholics, 1000 Jews); estimated pop. (1877) 47,500. The springs of W. are spoken of by Pliny as the *Fontes Mattiaci*, and on the Heidenberg, N. of the town, traces of a Roman fortress were discovered in 1838, which seems to have been connected with the town by a wall, the *Heidenmauer* ('heathens' wall'), in the ruins of which votive tablets and inscriptions have been discovered.

Wife. See HUSBAND AND WIFE.

Wig. See PERIWIG.

Wig'an (anc. *Wibiggan*, 'holy building'), an important manufacturing, mining, and railway centre in Lancashire, is situated on the river Douglas, 19½ miles E.N.E. of Liverpool by rail. Of its six Anglican churches, the oldest is All Saints' (14th c.; restored 1850), the latest St. Andrew's (1878). For the Catholics, who are strong in W., schools for 800 children were opened in 1874; a church of St. Joseph was built (1877–78); and the foundation-stone of another, St. Patrick's, was laid by Cardinal Manning, 2d Sept. 1878. Among the buildings are the town-hall and public hall, with a concert-room and mechanics' institute; a market-hall and fish-market, erected (1877) at a cost of £14,000; a free library (1877); a hospital, opened by the Prince of Wales (1873), and a grammar-school. A public park of nearly 30 acres was opened in 1878. Cotton-spinning is the staple industry, but there are also iron and brass foundries, cutlery and chemical works, and manufactures of oil-cloths, tarpaulins, &c. The neighbouring collieries have been the scene of many disastrous explosions, one of which in 1877 cost 37 lives, another, in 1878, 200. W. publishes two bi-weekly newspapers, and returns two members to Parliament. Pop. (1877) 39,110; estimated (1878) 44,000. Historically W. is famous as the Earl of Derby's head-quarters in the Great Rebellion (1651), and resting-place of the Young Pretender on his retreat from Derby (1745).

Wight, Isle of, an island in the English Channel, included in Hampshire, from which it is severed by the Solent (q. v.). Area, 93,341 acres; pop. (1871) 66,219. Rhomboidal in form, the island is traversed by a high ridge of swelling chalk-downs, whose loftiest point is Mottiston Down (693 feet), and ending E. in the Culver Cliffs, W. in the Needles headland, the Needles themselves being jagged splinters of the chalk wall that once stretched right across to the Isle of Purbeck. The southern promontory presents a second range, Shanklin, St. Boniface, and St. Catherine Downs (830 feet), and is separated from the central range by the valley of the Medina and Yar, the two chief streams. The beetling cliffs, honeycombed by the sea and gashed by the 'chines' or water-gullies, exhibit in all their fulness the manifold strata that render the island a favourite field for the geologist. Northward from the central chalk ridge, with its nearly vertical strata, are seen in regular succession the Lower, Middle, and Upper Eocene, composed mainly of fresh-water beds interstratified with a few marine beds, while southward from the same are the older members of the Cretaceous

system from the Upper Greensand and Gault, through the Lower Greensand to the underlying Weald clay with its Saurian remains and submerged forests. The stiff clay to the N. of the chalk-ridge pasture-lands grows noble oaks, but is not so well suited for tillage as the rich red loam of the southern half. The mildness of the climate has long attracted consumptive patients, for the poorer class of whom a National Consumption Hospital was founded at Ventnor in 1872. Hundreds of other visitors are yearly drawn by the natural charms of 'that beautiful island, which,' said Sir Walter Scott, 'he who has once seen never forgets;' and Ryde and Cowes are important yachting centres. The latter is also the chief port of the island, being entered (1878) by 19,296 vessels of 1,199,094 tons, and cleared by 18,939 of 1,195,538 tons—chiefly yachts. In 1877 its imports amounted to £11,882, its exports (chiefly grain and wool) to £942. The island contains (1879) 25½ miles of railway; and steamers ply constantly between Ryde and Southampton, Yarmouth and Lymington. The churches of the island are generally more picturesque than architecturally beautiful, but Yaverland, Wootton, Northwood, and Shalfleet retain fragments of Norman work. Carisbrooke Castle, with its grand entrance gateway, is surpassed by few English military ruins; the scanty remains of the Cistercian abbey of Quarr (1132), Osborne, the marine residence of the Queen, and Farringford, for many years the Laureate's home, deserve a notice, as also do the numerous gabled, grey-stone manor-houses. The island, which up to the Reform Bill returned six members, now returns only two, one for itself and one for Ryde.

Doubtfully identified with the *Iktis* of Greek and *Vecta* or *Vectis* of Roman writers, the I. of W. preserves numerous traces of its first inhabitants, the Celtæ and Belgæ—the Longstone *menhir*, innumerable barrows, and the bowl-shaped depressions called 'British villages.' The Roman conquest under Vespasian (43 A.D.) is only recorded by a solitary villa, lately discovered at Carisbrooke; but the Old English, or rather Jutish, cemeteries have yielded many valuable finds. The Jutish occupation dates from 530, when Cerdic of Wessex mastered the island; in 661 it was wrested from Wessex by Wulfhere of Mercia, who transferred it to Ethelwald, the South Saxon king. This 'fierce catechumen' doomed the whole pagan population to extermination, but St. Wilfrith (q. v.), claiming a fourth part as Christ's heritage, founded the first Christian church in W. Danish invasions make up the history of the next three centuries; after the Conquest the lordship of this perilous outpost was granted to William FitzOsbern. On the rebellion of Fitz Osbern's son it was transferred by Henry I. to the De Redvers family, whose last descendant, the Countess of Albemarle, sold it to Edward I. (1293). In the French wars the island suffered grievously, and the flower of its manhood fell with the last of its lords, Sir Edward Woodville, in the defeat of St. Aubin's (1488); and though it so far recovered as to be able to take an active part in the repulse of François I.'s armada (1545), yet its condition under Elizabeth is pictured as deplorable. With the captivity of Charles I. in Carisbrooke Castle (1647-48) the history of the island closes; but one may well recall its memories of Nicholas Udall, Alexander Ross, Dr. Hooke, Bishop Ken, Legh Richmond, Dean Hook, John Sterling, and its greatest worthy of all, Dr. Thomas Arnold of Rugby. See Sir Richard Worsley, *The History of the I. of W.* (Lond. 1781); the *Quarterly Review* for July 1874; and Adams, *I. of W.* (Edinb. 1877).

Wig'ton ('holy town'), a town of Cumberland, England, 11 miles W.S.W. of Carlisle by rail. There is a parish church of 1788, and four chapels. W. manufactures calicoes and ginghams, and there is some tanning and brewing. The district is mainly agricultural. Pop. (1871) 3425.

Wig'town (the 'town on the *wic*' or bay), the capital of the county of Wigtown, situated on W. Bay, near the mouth of the Bladenoch Water, 58 miles W.S.W. of Dumfries by rail. It consists mainly of one broad street, having in the centre an enclosed square, on the E. side of which is the New Court House, erected 1862-63, the finest building in the town. The parish church, a fine Gothic structure, was built in 1852. On the Windyhill, near the town, is a monument to the 'Wigtown Martyrs,' who were drowned in the Bladenoch in 1685. The harbour accommodates vessels of 300 tons. In 1878 there entered it 807 vessels of 50,427 tons, and cleared 783 of 48,167 tons. The number of registered fishing-boats was 21 of 99 tons. Pop. (1871) 1859.

Wig'townshire, the most southerly county of Scotland, forming the western half of the ancient province of Galloway (q. v.), and bounded N. by Ayrshire, E. by Kirkcudbright and the Solway Firth, S. by the Irish Sea, and W. by the North Channel. Area 327,906 acres; pop. (1871) 38,602. The county is deeply intersected by two arms of the sea, Luce Bay on the S. and Loch Ryan (q. v.) on the N., which, approaching within 6 miles of each other, divide W. into two unequal portions, the western, a peninsula 28 miles long by 1 to 6 miles wide, called the Rhinns of Galloway—its northern extremity being Corsewall Point and its southern the Mull of Galloway—connected with the eastern by a flat isthmus. Between Luce Bay and Wigtown Bay is a broad triangular peninsula, forming the district popularly known as the Machars, while the remaining part of the county N. of the Machars and between Loch Ryan and Kirkcudbright is called the Moors. The chief range of hills, a spur from the Lowthers, runs from E. to W. along the N., forming the watershed between Ayrshire and W. Its highest points are Craigairie Fell (1000 feet), Benbake (1000 feet), and Miltonise Fell (970 feet). Three low ranges run S.E., S., and S.W. The highest point in the Rhinns is Cairnpiot Fell (593 feet). The chief rivers are the Cree and the Bladenoch, with its tributary the Tarff, flowing to Wigtown Bay; and the Luce with its affluent the Cross Water, and Piltanton from the Rhinns, emptying into Luce Bay. A striking feature in the water-system of W. is the great number of small lochs and expanses of boggy ground called 'flows.' About ⅛ of the surface is occupied with moor, almost entirely unproductive. Though the soil is nowhere very fertile, excellent crops are obtained under a careful system of farming. Most of the farms are dairy-farms, and the export of cheese is the chief source of wealth in W. In 1878 there were under oats, 32,539 acres; wheat, 2658 acres; barley, 2512 acres; turnips, 16,253 acres; grasses under rotation, 52,437 acres; permanent pasture, 36,201 acres. In the same year there were within the county 5792 horses, 40,401 cattle, 131,030 sheep, and 9491 pigs. The chief towns and villages in W. are Wigtown, Stranraer, Newton-Stewart, Whithorn, Glenluce, Portpatrick, Drumore, Newluce, Lochans, and Kirkcolm. The valued rent in 1674 was £67,607 Scots, or £5634; in 1877-78, £248,113. See M'Ilwraith's *Guide to Wigtownshire* (Stranraer 1876).

Wil'berforce, William, was born at Hull, August 24, 1759, of an old and wealthy Yorkshire stock. Between the ages of nine and twelve he lived with an extremely religious aunt at Wimbledon, and here the seeds of the piety and earnestness he subsequently developed were probably sown. On his removal to a school in Yorkshire, however, he seems to have forgotten the religious impressions he had received, though already his mind had been turned to the question to which he afterwards devoted his life, as is proved by a letter 'on the odious traffic in human flesh' which he wrote while yet at school. At the age of seventeen he entered St. John's College, Cambridge, and fell at first among a wild and 'licentious set of men,' whom he deserted in the course of a year and devoted himself to a higher society, forming the acquaintance of Pitt, whose intimate friend he afterwards became. He devoted himself principally to classics, and graduated with credit. Coming into a large fortune on his majority, he determined to devote himself to a public career, and was returned to Parliament for the borough of Hull in 1780. He now plunged into the vortex of London life, but soon withdrew from it, as he had done in Cambridge. The position he occupied in Parliament was independent, but he always maintained his friendship for and sympathy with Pitt. His powers as an orator were meanwhile developing themselves, and in 1784 he did good service to Pitt's ministry by carrying the county of York unopposed, and so setting an example to other constituencies. In this and the following year his religious convictions were revived, deepened, and strengthened, principally through the influence of Milner, the Dean of Carlisle, with whom he travelled on the Continent. His health, never robust, began to give way seriously soon after his return, but he nevertheless was active in the foundation of an Association for the Discouragement of Vice, and commenced earnestly his great agitation against the slave-trade. The battle was fought by himself in the House, and by Clarkson (q. v.) in the country. He introduced the bill and opened the debate on May 12, 1789, and was of course vehemently opposed, though Burke, Pitt, and Fox all supported him. It was not till 1804

that the bill passed the Commons; then it was lost in the Lords; lost again next year in the Commons, and not carried through both Houses till 1807. The slave-trade crushed, W. did not abandon his exertions in the cause of humanity, and the agitation against slavery as an institution was at once commenced, as well as strenuous efforts to put down the slave-trade abroad. He also occupied himself with many minor philanthropic schemes. Compelled by declining health to retire from Parliament in 1825, he handed over the conduct of the anti-slavery cause to Sir T. Fowell Buxton, and withdrew to his estate at Highwood, near London. Pecuniary losses compelled him to relinquish this residence in 1831, and from then until his death he lived principally in Kent and the Isle of Wight. Three days before his death the bill for the abolition of slavery passed its second reading in the House of Commons, and he thanked God that he had lived to see England spend £20,000,000 in such a cause. He died in London, July 29, 1833, and was buried in Westminster Abbey. His *Practical View of the Prevailing Religious System, contrasted with Real Christianity*, published in 1797, was at one time very popular, 7500 copies being sold in six months, while it was translated into several foreign languages. See his *Life* by his two sons, Robert Isaac and Samuel (5 vols. Lond. 1838; revised and condensed 1868).—**Robert Isaac W.**, second son of the preceding, was born at Clapham, December 19, 1802, took orders in the English Church, became archdeacon of the East Riding of York, was author of numerous theological works, and (as did two of his brothers) went over to the Roman Catholic Church in 1854. He died at Albano, Italy, 4th February 1857.—**Samuel W.**, brother of the preceding, was born at Clapham, 7th September 1805, entered the English Church, became Canon of Winchester in 1840, was Bampton lecturer in 1841, became Dean of Westminster in 1845, Bishop of Oxford in the same year, and Bishop of Winchester in 1869. He was noted as an orator in the House of Lords, and was author of *Agathos* (Lond. 1840), *The Rocky Island* (Lond. 1840), *History of the Episcopal Church in America* (Lond. 1844), *Heroes of Hebrew History* (Lond. 1870), *Essays, contributed to the Quarterly Review* (Lond. 1874), as well as numerous sermons and other theological works. He was killed by a fall from his horse, near Dorking, 19th July 1873. See his Life, edited by Canon Ashwell (Lond. 1879).

Wild'bad, a favourite watering-place of Würtemberg, in the beautiful pine-clad valley of the Enz, a tributary of the Neckar, 28 miles W. of Stuttgart by rail. W.'s celebrity depends wholly on the warm alkaline springs (94°-107° F.) which rise within the very baths, and are visited annually by about 5000 rheumatic patients, who bathe for the most part in large companies, as at Leuk. The only buildings of importance are hotels. Pop. (1875) 3236. See Reny, *Das W. und seine Umgebungen* (Wildb. 1876).

Wil'derness, Battles of the, in the American Civil War, the name conferred on a series of desperate actions in Virginia between the Federals under Meade and Grant, and the Confederates under Lee, May 5-31, 1864. Commencing in the 'Wilderness' proper, a swampy expanse of brushwood to the S. of the Rapidan, the contest was renewed at Spottsylvania and on the bank of the North Anna, and ended in the Federals' repulse at Cold Harbour in their attempt to enter Richmond. The Federal loss was officially stated at 41,398, including 33,948 killed and wounded; that of the Confederates was certainly less.

Wild Fowl, the name applied to birds of various species, which are pursued as game, but restricted by some authorities to birds belonging to the *Grallatorial* and *Natatorial* orders—in other words, to the waders and swimmers. *Wild-fowling* is a favourite British sport, involving in its exercise care, ingenuity, cunning, and even danger. W. F. may be approached with a view to their capture or destruction in various ways. In 'fowling' proper, the *decoy-pond* is perhaps the best-known means for the capture of W. F. in a living state. This pond is constructed in a secluded place, well sheltered by trees, and with a plentiful supply of reeds and sedges. From this pond *pipes* or narrow passages are led, these passages attaining each a length of from 60 to 80 yards, and gradually narrowing towards its termination. Above, the pipe is bridged and covered by a light network, and at its termination it ends in a *tunnel net*, which is, as a rule, carried out on to the land. *Decoy-ducks*, which come to be fed at the call of the attendants, are used to entice their wild neighbours into the pipe; but the *decoy-dog* is perhaps a more valuable ally of the fowler. This dog is named a 'piper.' It is of a small breed, and indulges in playful gambols by the side of the pipe, appearing now and then in advance of the fowl, which, led by curiosity, swims onwards towards the dog, and is thus drawn towards the terminal net. The dog preserves a perfect silence during its manœuvres. The basins named *flight-ponds* consist of sheets of water of limited extent, guarded by nets so placed as to entrap such birds as the Pochard (q. v.) as they rise from the water. W. F. are also captured by shooting from *punts* and *shooting-boats*, great care being necessary in approaching the haunts of the birds; and the *stalking-horse*, still used in some parts of England, is also employed; the body of the horse—which requires special training for its work—being used to conceal the sportsman from the game.

Wild-Fowl Preservation.—The Act 39 and 40 Vict. c. 29 imposes a penalty of £1, with costs of conviction, on any one who intentionally kills, or takes, or exposes for sale, between the 15th of February and 10th of June, any of the different species—Avocet, curlew, dotterell, dunlin, godwit, greenshank, lapwing, mallard, oxbird, peewit, phalarope, plover, plover's-page, pochard, purre, redshank, reeve or ruff, sanderling, sand-grouse, sandpiper, sea-lark, shoveller, snipe, spoonbill, stint, stone-curlew, stonehatch, summer-snipe, teal kick-knee, whaup, whimbre, widgeon, wild-duck, and wild-goose.

Wil'frith, St., born in Northumbria in 634, studied at Lindisfarn, and in his twentieth year repaired to Rome to obtain a decision as to the due season for celebrating Easter (q. v.). On his homeward voyage he formed a friendship with Delfinus of Lyon, whence after three years' stay he returned to England in time to found a monastery at Ripon (664), and as a priest to take part in the famous Council of Streoneshalh or Whitby (q. v.). Here against Colman he triumphantly pleaded St. Peter's claims to obedience as paramount to those of St. Columba, and Oswiu, king of Northumbria, deciding in his favour, conferred on him the vacant bishopric of York. Opposed by St. Chad, he did not, however, obtain possession of the see till 669; from 670 his strife for supremacy began with Ecgfrith, the new Northumbrian king. It ended in his deposition, his visit to Rome for redress, and an incidental mission to the heathen Frisians, thousands of whom are said to have been brought to Christianity by W.'s sermons in their common Low German tongue. He came back with a papal decree in his favour, but soon found himself lodged in Ecgfrith's prison; laboured awhile, on his escape, among the pagans of the Weald of Sussex and the Isle of Wight; then, after a temporary triumph, delusive hopes of succeeding Theodore of Tarsus in the primacy, and a second great council (692), was again deposed and excommunicated, and again took flight to Rome. He tarried there till 705, but ended his stormy career at Oundle monastery in Northamptonshire, April 24, 709.

Wil'helm I. (Friedrich Ludwig W.), King of Prussia and Emperor of the Germans, is the second son of Friedrich Wilhelm III. of Prussia, and was born March 22, 1797. He early entered the army, and took part in the campaigns of 1813-14. The accession of his brother Friedrich Wilhelm IV. (1840) gave W. the governorship of Pommern, and in 1847 he entered the United Landtag, which his brother had so tardily granted; but his absolutist principles were obnoxious to the people, and he fled to England on the troubles of 1848. He re-entered the Diet the following June, but mixed little in its political struggles, contenting himself with suppressing by force of arms a rising in Baden in favour of a constitutional government. The illness of the king unfitting him for governing, W. was appointed regent October 9, 1858, till the death of the former brought him to the throne, October 18, 1861. His first care was the better organisation of the Prussian army, and this involved him in a conflict with the Liberal Chambers, which would not sanction the increased expenditure required for the scheme. W. now appointed as his prime minister and minister for foreign affairs, Otto von Bismarck-Schönhausen, and in the personality of the great minister, W. and Prussian history itself have been merged. Bismarck took up the king's plans and ideas, and carried them through with his energy of character and iron will. A contemptuous dissolution of the Chambers removed obstacles to the army scheme, and Bismarck skilfully met the disaffection at home by turning attention to the Danish war. The close

of this war (1864) made it clear that a struggle was imminent between Austria and Prussia for supremacy in the German States, and Bismarck declared for a settlement of 'blood and iron.' The people regarded it as a 'war of brothers,' and petitions from all sides were presented to W. in favour of peace. But the obstinacy of Austria destroyed such hopes, and hostilities began June 7, 1866. On July 2, W. took supreme command of the Prussian army, and the next day the Austrians suffered the great and decisive defeat of Königgrätz. W. now returned to Berlin, and a newly-elected House of Representatives forgave all unconstitutional conduct in the enthusiasm of victory. North Germany was now led by Prussia; W. only required to bring in the Southern States to form the German Empire. They were wavering, when the declaration of war by France (July 15, 1870) decided them to throw in their lot with Prussia. W again assumed the supreme command of his armies, which included the forces of the South German princes, and following in the wake of their successes, he received Napoleon's sword at Sedan, September 2, and fixed his headquarters at Versailles, October 5. The common sympathies generated by the war had meanwhile been drawing the southern and northern states of Germany closer, and treaties were signed in November 1870 between the Northern Confederation and Hessen-Baden, Bavaria, Würtemberg in favour of a German Confederation, whose president should be Emperor of the Germans. As the result of these, King W. was proclaimed Emperor, January 18, 1871, in the Hall of Mirrors at Versailles. W. and Bismarck had now attained their great objects abroad, the 'unity, independence, and liberty of Germany.' They have since turned to internal questions—Ultramontanism, Education, Socialism. Bismarck's contempt for public opinion has renewed disaffection; the Prince's life has been threatened, and in 1878 two attempts were made to assassinate the Emperor—by Hœdel on May 11, and on June 2 by Dr. Nobiling. In the latter W. was severely wounded, and great sympathy and affection was expressed for him by the people, who acknowledge his unselfish and untiring efforts on their behalf, and are proud of him as the restorer of the German Empire, and who endure, on these accounts, much at his and Prince Bismarck's hands. W. married Marie Luise Auguste Katharine of Sachsen-Weimar (June 11, 1829), and has by her, Friedrich, Crown Prince, and Luise Marie Elizabeth, married to the Grand-Duke Friedrich of Baden. Interesting glimpses of the Emperor are to be had in Prince Bismarck's *Letters* (trans. by Maxse, Lond. 1878). See also Klaczko's *Two Chancellors* (Lond. 1876), and Schmidt and Otto's *Kaiser W. und seine Zeit* (2d ed. 2 vols. Leip 1878).

Wil'helmshöhe. See Kassel.

Wil'helmshaven, a town belonging to the Prussian Landdrostei of Aurich, but surrounded by the Oldenburg territory, lies on the Jahde Bay, 32¾ miles N. of Oldenburg by rail. It has one Evangelical and one Catholic church. W. is the chief war-harbour of Germany on the North Sea. Pop. (1875) 10,158.

Wilkes, Charles, an American naval commander and discoverer, was born at New York in 1801, entered the U.S. navy as midshipman (January 1, 1818), and rose gradually to the rank of rear-admiral, which he attained in 1866. Between 1838 and 1842 he conducted an expedition, organised in the United States, for the exploration of the Southern and Pacific Oceans, a report of which he subsequently published, along with a detailed volume on the meteorological data accumulated. In 1861 he signalised himself by the forcible abstraction from the British mail-steamer *Trent* of two Commissioners to Europe from the Confederate States, for which act, however, his government had subsequently to make amends. The London Geographical Society awarded W. their gold medal in 1848. He died at Washington, February 8, 1877.

Wilkes, John, one of the most notable political figures of the close of last century, was the son of a wealthy distiller in Clerkenwell, where he was born 17th October 1727. He was educated chiefly at the University of Leyden. In 1749 he married a Miss Mead, an heiress, ten years older than himself, from whom, after the birth of a daughter, he was separated, with a scandal very damaging to his character. Settling in Buckinghamshire, he became High Sheriff of the county, and in 1757 was returned to Parliament for the borough of Aylesbury. In June 1762 he commenced his famous weekly paper, the *North Briton*, in which, with the assistance, it is said, of Churchill the satirist and Lord Temple, he attacked and overthrew Lord Bute's ministry. Greville's ministry, which followed, fared no better at his hands, until, on April 23, 1763, he published a violent attack upon the King, accusing him of having uttered a lie from the throne. He was arrested on a 'general warrant,' thrown into the Tower, and had his papers seized; while the seditious *North Briton* (No. 45) was, by the order of the House of Commons, burned by the common hangman. He was soon released, however, it being decided that general warrants were 'unconstitutional, illegal, and absolutely void,' and he was awarded £1000 damages in a suit against the Under-Secretary of State for the seizure of his papers. In the beginning of the next year he was expelled from the House of Commons, and was tried before Lord Mansfield, at the instance of the House of Peers, for republishing No. 45 of the *North Briton*, and for printing and privately circulating an obscene poem called *An Essay on Woman*. On both charges he was found guilty, and having fled to France, was outlawed. It was proved, however, that his accusers had obtained a copy of the poem by dishonourable means, and his popularity became greater than ever. Returning to England in 1768, he was elected to Parliament by the county of Middlesex, arrested on account of his outlawry, rescued by the mob, but ultimately imprisoned of his own free will. On the assembling of Parliament, a mob gathered outside the prison to conduct him to the House, and was only dispersed by the military after some bloodshed. The sentence of outlawry was reversed, but he was a second time expelled from the House of Commons for having charged Lord Weymouth with 'planning the horrid massacre' by which the riot was put down. Again and again he was returned to Parliament for Middlesex, though the House had declared him incapable of sitting in it, and ultimately his opponent, Colonel Luttrell, took his seat, though he had only polled a few votes, on the ground that the votes polled for W. were illegal. This contest made him the popular idol, and though he was now in prison for libel, rich presents were sent him, and £20,000 were subscribed to pay his debts. Liberated in April 1770, he was elected Alderman of the City of London, and was several times summoned to answer at the bar of the House of Commons for his conduct in that office, but always refused to appear except as member for Middlesex. In 1774 he became Lord Mayor, and being once more elected for Middlesex, took his seat in the House, though he did not until 1782 procure the expunging from the records of the resolutions of expulsion. He became in 1779 Chamberlain of the City of London, which post he held until his death, in London, 27th December 1797. He edited Catullus (1788) and Theophrastus (1790), and his *Letters to his Daughter* were published in 1804. He is said to have been the ugliest man of his day, but was a bright wit and had a rare gift of popular oratory. See Almon's *Correspondence of J. W., with a Memoir* (Lond. 1805, 5 vols.), Watson's *Biographies of W. and Cobbett* (Lond. 1870), and W. Fraser Rae's *W., Sheridan, and Fox* (Lond. 1871).

Wilk'ie, Sir David, the greatest of Scottish genre painters, was born at Cults, in Fifeshire, 18th November 1785. The son of a minister, he was intended for the Church, but his love of drawing overcame all opposition, and in 1799 he was placed in the Trustees' Academy, Edinburgh, where he was a diligent student under John Graham for four years. Returning home, he painted 'Pitlassie Fair,' which he sold for £25. The work, which is small in size, is characteristically full of figures and incidents, but in its redness and harshness gives little promise of the artist's future excellence in colour. In May 1805 W. sailed from Leith to London, and there secured admission to the schools of the Royal Academy. At the Academy's Exhibition of 1806 his 'Village Politicians' took the public interest by storm, with its air of local truth, force of character, and gleeful originality. The works which followed are known, at least through engravings, to all the world, comprising such masterpieces as 'The Blind Fiddler' (1807), 'Card-Players' (1808), 'Rent Day' (1809), 'Jew's Harp,' 'Blind Man's Buff' (1812), 'Village Festival' (1813), 'Distraining for Rent' (1815), 'Penny Wedding' (1820), 'Reading the Will' (1821). The 'Rent Day' brought him 300 guineas, and gained him his election as A.R.A. Two years later he was made an R.A., and in 1814, along with Haydon, made his first visit to the Continent, spending some six weeks in France. In 1821-22

he painted for the Duke of Wellington the famous semi-historical work, 'Chelsea Pensioners Reading the Gazette of Waterloo,' for which he received 1200 guineas. On commission for George IV. he produced in 1823 'The Parish Beadle,' widely regarded as the culmination of his early and truly great style. His promotion to the rank of King's Limner, on the death of Raeburn, was signalised by his picture of 'George IV. entering Holyrood.' Meanwhile his health, never robust, became affected by domestic troubles and pecuniary losses; and a long tour on the Continent (1825-28) left him an imitator, bold and successful, but still an imitator, of the old masters. Before returning he visited Madrid, and, fired with enthusiasm by the works of Velasquez, he succeeded, in 'The Guerilla Council of War,' 'Maid of Saragossa,' and 'Confessional,' in approaching the Spanish effect and tone. The public was disagreeably surprised by this change in W., and perhaps there is reason to regret that a manner more ambitious, touched as it is with many graces, should have taken the place of his character sketches and domestic stories on which the fame of the painter rests. On the death of Lawrence, W. was nominated Painter-in-Ordinary, and in 1836 he received the honour of knighthood. After painting several portraits, and advancing a long-delayed work, 'John Knox Preaching,' he suddenly started for the East to seek new fields of art in the localities of sacred narrative. But on his return, while at Malta, he was attacked by sudden illness, and died off Gibraltar, 1st June 1841. On the same evening his body was committed to the deep, but, as an appropriate memorial, his statue by S. Joseph was placed in the vestibule of the National Gallery. The art which will always entitle W. to a higher place in the English school, while it deals with common incidents and familiar phases of character, is ennobled by the sentiment of pathos, or redeemed from vulgarity by humour. A genial sage, original moralist, and the great art-master of rural character and manners, W. as a painter has a close affinity with the Dutch school, subordinating colour as he does to careful finish and the dainty manipulation of details. The chief of his early works were engraved in line by Raimbach & Burnet, and in 1842 some 130 of his works were exhibited with the old masters at the British Institution. See *Life* by A. Cunningham (Lond. 1844).

Wilkinson, Sir John Gardner, born at Hardendale, Westmoreland, 5th October 1797, studied at Harrow and Exeter College, Oxford, and then during a twelve years' residence in Egypt, which he visited for his health, devoted himself to a laborious investigation of the antiquities of that country, whose first-fruits was *The Topography of Thebes and General View of Egypt* (1835). This was followed by *The Manners and Customs of the Ancient Egyptians* (5 vols. 1837-41; new ed. by Dr. Birch, 3 vols. 1878), a work that, illustrated by the author's beautiful drawings, remains a standard authority on Egyptology; and later publications were *Modern Egypt and Thebes* (2 vols. 1844), *Architecture of Ancient Egypt* (1860), *Popular Account of the Ancient Egyptians* (1854; new ed. 1871), *Egypt in the Time of the Pharaohs* (1857), and numerous papers read before the Geographical Society. He further assisted Rawlinson in the Egyptian portion of his translation of Herodotus, in *Dalmatia and Montenegro* (2 vols. 1848) described a visit to the Slavonic Provinces, and wrote *On Colour and the Necessity for a General Diffusion of Taste* (1858). Knighted in 1839, he died at Llandovery, Caermarthenshire, 29th October 1875.

Will is in law an act by which a man disposes of his property after his death. Formerly a verbal or *nuncupative* W. was, under certain circumstances, valid regarding personal property; but by 1 Vict. cap. 26 all verbal wills subsequent to 31st December 1837 are void, except those of soldiers and sailors on service. A W. in England must be attested by two witnesses; but in Scotch law see HOLOGRAPH; and regarding real estate in England see DEVISE. A legacy to an attesting witness, or his or her wife or husband, is void. Marriage revokes a W. made previous to it, the only other means of revocation being destruction of the writing by the testator, or by his direction; or by execution of a new will at variance with the previous one. The following classes cannot make a W.: infants (see AGE), idiots, lunatics, persons in dotage, felons, and outlaws. A W. made under intoxication is void, unless subsequently acquiesced in. A married woman cannot make a W. without consent of her husband, unless she is legally freed from him; or unless by provision under marriage contract. By the Wills Act, which does not apply to Scotland, all property, real and personal, may be disposed of by W. in the same manner; and the owner of real estate can leave it to whom he pleases. It is a common error to suppose that *a shilling*, or other sum real or nominal, must be left to the heir-at-law effectually to disinherit him. A W. made under the influence of importunity, or coercion, or fraud, is void. Any intention of the testator will be given effect to, unless frivolous or contrary to law (see LEGACY). Regarding a *codicil*, see that article. Printed forms of wills should not be trusted to. Great care should be taken to identify a legatee. In leaving a legacy to a married woman, trustees should be appointed, or it will fall to her husband. Any one dying without a W. is said to die *intestate* (see INTESTACY). In Scotland, only *movable*, *i.e. personal*, property can be disposed of by W. To dispose of *heritable* or *real* estate after the testator's death, there must be a conveyance in legal form to the disponee, with reservation of the testator's liferent. He usually also reserves power to alter. See Flood's *Elementary Treatise on the Law of Wills* (Lond. 1877).

Will, The, is that power of control which the mind possesses over its own operations. It is frequently spoken of as a distinct faculty; but we should remember that it is the whole mind that wills, for the mind cannot be conceived as a whole divided into parts like the body, but rather as a unity that may act in different directions, and perform various functions. Now it is evident that the mind does not act without a cause—that is to say, there is no act of W. without a motive; but what is the exact relation between them? Does the W. determine the strongest motive, or does the strongest motive determine the W.? In other words, is the W. free? This Hume calls the 'most contentious question of metaphysics, the most contentious science.' But it is more than a mere vain dispute. The most vital problems of human existence and destiny depend upon the answer. The arguments on either side of the question may be thus briefly given.—A. For the freedom of the W. (1) The testimony of consciousness. We have the best and clearest evidence here that can possibly be given us. In the act of deciding we are clearly conscious that we might have decided otherwise, and we believe the same thing when the act is looked at before or after completion. (2) Men recognise that they are responsible for their actions; but responsibility implies a power in the agent to do otherwise. We do not hold a physical force responsible. We may say that it was *the cause* of a given effect; but of a man we say he *ought*, and this implies that he *can*. (3) Punishment is justifiable only on this theory. It is inflicted because out of two possibilities of action the man has chosen the evil one. If the power of choice were absent, then *summum jus, summa injustitia*, all law would be simply unmeaning revenge. (4) How otherwise can we explain what are called the moral sentiments—remorse, shame, commendation of virtuous action, &c.? Any such feelings are inexplicable except on the hypothesis that they are called into action by the contemplation of the conduct of a free W. agent. (5) We may sum up these arguments thus: the course of all human action at once presupposes and proves the theory; and its truth is assumed consciously or unconsciously in every one of our actions as rational and moral agents. B. Against the freedom of the W. The advocates of Determinism bring forward the following arguments in proof of their position:—It is necessary, they affirm, first clearly to understand what the determinist theory really is. It is *not* fatalism, and therefore the term 'Necessitarians' so often applied to them must be set aside as misleading. If I know that a house will be burned to the ground to-morrow, my foreknowledge would on the fatalistic theory make no difference in the result, but on the determinist hypothesis it would supply me with motives urging me to take efficient means to avert the disaster. J. S. Mill puts the theory thus: 'A volition is a moral effect, which follows the corresponding moral causes as certainly and invariably as physical effects follow their physical causes. Whether it *must* do so I acknowledge myself to be entirely ignorant, be the phenomenon moral or physical. All I know is that it always *does*.' In short, (1) we must apply the law of causality to mind just as we apply it in the external world. If we carefully look back on any act, and consider the motives that influenced us at the time, we clearly see that we could not have acted otherwise than we did. If we had, the motives, that is to say the causes, must have been different. (2) As to

punishment, the only proper justification for its infliction is the good of society, and of the criminal himself. We thus supply motives towards well-doing. (3) Responsibility simply means liability to punishment; while (4) the existence of the moral sentiment is explained by the influence on us of education and of the opinion of others—a man will feel shame at the commission of certain acts whether he could have prevented them or not. (5) If the W. has a choice between motives, these must be of unequal force: if it always chooses the most powerful, then determinism is proved; if it always chooses the weaker, that is surely more absurd than to say it acts from no motive at all—a position which is not maintained. If it choose a motive, it must have had a motive for such choice, and so on. Thus we are brought back to the continuous chain of cause and effect operative in external nature.

If we enter the region of metaphysical theology, we find a very great difficulty in regard to free W. It seems directly to collide with Divine sovereignty. From the very conception of Deity, all must be foreordained, and there is no room left for independent human action. This is a real, and to some extent an insoluble, difficulty. Wise theologians have therefore relegated it to the province of faith or belief. From reflection on the foregoing it will be seen how important this question is in ethics, metaphysics, and theology. It has been a question in debate from the earliest period in the history of human thought, and so it will remain a question in debate to the close, for no final or absolutely satisfactory answer can be given to it. The doom of philosophy—to seek and *not* to find—is in no other case felt so fatally as in this, where so many perplexing and profoundly important questions are concerned. A full quotation of authorities, with summation of arguments on both sides, will be found in Calderwood's *Handbook of Moral Philosophy*.

Will'em II. (W. Georg Lodewijk), King of the Netherlands, Grand Duke of Luxembourg, Duke of Limburg, son of W. I., was born at the Hague, December 6, 1792. The French republican army drove his father from the throne in 1795, and the prince was educated at the military school of Berlin, and at Oxford. In 1811 he joined Wellington's army in the Peninsula as an aide-de-camp. Soon promoted to a colonelship, he was distinguished by great bravery at Ciudad Rodrigo, Salamanca, and Vittoria, and at Badajoz he entered the breach at the head of the storming column. On the return of his father to the throne of the Netherlands, W. received the command of the Dutch army, and took part in the battles of Quatre-Bras and of Waterloo, where he was wounded. On February 26, 1816, he married Anna Paulowna, sister of the Emperor Alexander I. of Russia. In the troubles of 1830, W. acted as mediator between the government and the disaffected; but his acknowledgment of the independence of Belgium caused his recall. He again entered the field on the short and unsuccessful August campaign against Belgium, when the armed intervention of France stopped his progress. W. now withdrew to private life, till the abdication of W. I. brought him to the throne (1840). A struggle followed over reforms which W. would not grant till the French Revolution of 1848 made refusal impossible. The two chambers of the new constitution had hardly met when W. died, March 17, 1849. See *Het Leven van Willem II.*, by J. J. Abink. —**W. III. (W. Alexander Paul Frederik Lodewijk)**, eldest son of the preceding, was born February 19, 1817, educated by private tutors and at the University of Leyden, and succeeded to the crown on the death of his father, March 17, 1849. Ten years previously he had married Sophie, daughter of King Wilhelm of Würtemberg, by whom he has two sons; Willem, born September 4, 1840, and Alexander, born August 25, 1851. His peaceful reign has given opportunity for internal development. A network of railways has covered the country, a canal has been cut through the Isthmus of Holland, which gives easy access to Amsterdam, and the entrance to Rotterdam Harbour improved. By the drainage of Haarlem Lake in 1852, 72 square miles of land, on which a population of 7000 or 8000 people now dwell, was reclaimed from the sea, and the drainage of the Zuyder Zee is now being carried on. W. lost his queen June 3, 1877, and in 1879 married the Princess Emma of Waldeck.

Will'ems, Jan Frans, the 'Father of the Flemings,' was born at Bouchout, near Antwerp, 11th March 1793, and as a lad took part in the Mysteries acted by the Lierre *Rederijkers*. His thoughts were thus turned to poetry, and two years after his entering the office of an Antwerp notary he won a prize for the best poem upon the battle of Friedland and peace of Tilsit (1811). His ode *Aen de Belgen* (1818), hailing the revival of Belgian nationality under Holland's protection, was coldly received by W.'s countrymen, but earned him a post under the Dutch government, while a series of masterly philological works, including *Over de Nederduitsche Taal en Letterkunde* (2 vols. 1819-20), procured him admission to the Academy of Antwerp. Degraded by the new Belgian government of 1830 to a petty office at Encloo, W. laboured there on the Flemish version of *Reynard the Fox* (q. v.), in his edition of it (1834) calling on Flemings to help to preserve their ancient tongue. As archivist of Ghent from 1835 he edited the *Rymkronyk van Jan van Helu* (1836), *Brabantsche Yeesten* (1839-43), &c., and after his death at Ghent, on 14th June 1846, appeared his collection of old Flemish songs, and his *Mengelingen van Vaderlandschen Inhond*. See his Life by Snellaert (Ghent 1847).

Will'emstadt, the capital of Curaçao (q. v.). It stands on the S.W. coast, on St. Anna Bay, and is built in the style of a Dutch town. Pop. 7000.

Will'et (*Symphemia semipalmata*), a species of *Grallatorial* or wading birds, allied to the *Scolopacidæ* or snipes, and inhabiting the New World. They inhabit the northern regions in summer, and migrate southwards in winter. The average length is 15 inches; the general colour greyish brown above and white beneath. The wings are long and powerful, and the toes partially webbed—a feature from which the specific name 'semipalmata' has been derived. Both the flesh and eggs are eaten in America.

Will'iam I. 'the Conqueror,' King of England, was born in 1027. His parents were Robert, surnamed 'the Devil,' Duke of Normandy, and Arletta, the daughter of a tanner at Falaise. When Robert set out on his Jerusalem expedition, his son took his place at the age of seven, and in the following year the young deputy was by his father's death left to face a turbulent nobility alone. The disorder that surrounded him at last becoming open revolt, W. was surprised at his hunting seat at Valognes by the rising of the Bessin and Cotentin districts, but after flight across the Vire routed the rebels at Val de Dunes, 1047. By the influence of Geoffrey Martel, Comte d'Anjou, France, hitherto friendly, became the enemy of Normandy, and in 1054 a battle resulting from this hostility ended at Mortemer in W.'s victory. Four years later he inflicted on France a severer blow, routing its armies on the banks of the Dive. In 1060 Martel died, and both Maine and Brittany fell an easy prey to Norman invasion. W. laid some claim to the throne of England, in spite of his illegitimacy. He traced his descent from Queen Emma, sister of his grandfather, and obtained fealty from Harold, the son of Earl Godwine, when the latter visited the Norman court. But on the death of Eádward the Confessor, Harold was proclaimed king, and in bursts of fury W. levied army and fleet. He landed 60,000 men at Hastings, September 28, 1066. There he awaited Harold, who came from war in the N., and on the 14th of October was fought the battle of Senlac. This fierce contest ending in W.'s victory and Harold's death, the English elected Eádgar Ætheling king. Eádgar, however, quickly yielded his claim, and W. was crowned at Westminster, December 25. The new sovereign at first endeavoured to rule in gentleness, while reserving all power to the Normans. So successful was his usurpation that in a few months he thought it safe to return to Normandy, leaving government in the hands of his brother, Bishop Odo. Troubles soon recalled him, and a terrible change of policy ensued. The king trampled down all opposition, and marching as far N. as the Tees, laid waste all the country from the Humber upwards, killing 100,000 people. English monks, priests, and prelates gave way to Normans, the populace was reduced to serfdom, and the French tongue in the seats of influence and learning silenced the Old English. The iron power of the invaders was too great to be resisted, and such rebels as Morkere, Eádwine, and Hereward sank before the vigilant king, who even carried his conquests into Scotland, forcing it to submit in 1072. A conspiracy formed by his own nobles he quelled in the battle-field, and to a hostile fleet of Danes he gave gold enough to send them home. That these pirates might have no hold on the country, the whole north-east coast was laid bare. Castles were built and garrisoned all over the land, to keep the people

in the strictest subjection. Feudalism extended so far that 60,000 knights were at any moment ready for the royal service. The Norman Conquest was accomplished. An unsuccessful contest in Brittany next engaged the attention of W.; but this ended peacefully in the marriage of his daughter Constance to the Count of Brittany. The Conqueror, in 1053, had married Matilda, daughter of the fifth Earl of Flanders, and one of his sons by this union was in revolt because of a dispute regarding the duchy of Maine. Robert was backed by the young Norman nobility, and by the power of France, and after repeated contests an agreement was come to between father and son through the intervention of Matilda. Returning to England, W. invaded Wales in 1081. The remainder of his life was chiefly spent in Normandy, while Odo retained power in England. Philippe I. of France making an untimely joke on his corpulency and sickness, W. rose from his bed and set the French border in flames. At the burning of Nantes his horse stumbled on the hot embers, and gave its rider a fall which resulted in his death at Rouen, September 9, 1087. W. knew how to rule in these rough times, with sword for sceptre. King of a nation that detested him, with turbulent nobles and rebel sons, surrounded by greedy, powerful neighbours, he was sovereign among them all. He was fierce and cruel, but in his fiercest moments a consummate statesman. Through feudalism he not only secured his power, but civilised the duller English, whose sturdy worth mixed so well at last with Norman elegance and learning. The sway of the Conqueror, if severe, yet rescued the country from a multitude of petty rulers, amidst the squabbles of whom it was sinking into decay. Trade found in him the steadiest protector, and he organised the administration of justice in an efficient and impartial manner. The Domesday Book testifies to his vigorous administration, as did also a Church purged of much impurity and quickened from indolence into life. The primary source of information regarding the Conqueror is the work entitled *Gesta Willelmi* by his chaplain, William of Poitiers. See also Freeman's *History of the Norman Conquest* (5 vols. 1867-76); Stubbs's *Constitutional History* (3 vols. 1874-78); and Green's *Short History of the English People* (1875).—**W. II.**, King of England (surnamed *Rufus*, or 'Red'), second son of the Conqueror, was born in Normandy in 1056. On the death of William, Rufus crossed to England with his father's ring, and Lanfranc's influence set him on the throne. Instantly the barons rose on the side of the elder son Robert; but the English subjects gathered, and under Bishop Wulfstan defeated the western insurgents, while the king marched on Rochester, the garrison of which capitulated. Content among the English changed to discontent when Rufus disregarded his promise to restore the laws of the Confessor; and after the death of Lanfranc (1089) he ceased to govern with justice or moderation. In order to replenish his exhausted coffers he steadily refused to appoint to vacant sees, and appropriated the revenues; so that at his death one archbishopric, four bishoprics, and eleven abbeys lacked pastors. To this and other forms of exaction from the Church W.'s memorable opponent, Archbishop Anselm, offered a stern resistance that greatly mitigated the evil. Part of the funds wrung from the ecclesiastics went towards the completion of the Tower of London and the building of London Bridge. In 1091 W. the Red invaded Normandy, to retaliate Robert's attempt on England; and on Robert's partially submitting, the two brothers attacked the third, Henry, who was driven from his province of Cotentin. Returning to England with Robert, W. defeated the invaders from Wales and Scotland; but, pressing into the latter country, he was only saved by the aid of Eadgar the Ætheling. After a second time defeating a Scotch invading army, W. again attacked his brother Robert, whom he was on the point of subduing when disturbances in Wales called him back. Robert then pledged Normandy to his brother for £10,000 in order to join the First Crusade. A rebellion at Le Mans occurred, and at the news W. threw himself into the first boat at hand, crying 'Kings never drown!' and crossed the Channel. Another raid into Scotland, this time successful, compelled Malcolm to render homage, and the speedy death of that king allowed his superior to place on the throne as a dependant Edgar, the son of Margaret. While hunting in the New Forest he was killed, accidentally or intentionally, by an arrow of Sir Walter Tyrrel, August 2, 1100. Dissolute though he was, W. had great soldierly qualities. See Freeman's *History of the Norman Conquest* (5 vols. 1867-76), and Green's *Short History of the English People* (1875).—**W. III., King of England (William Henry of Nassau, Prince of Orange, Stadtholder of Holland)**, born at the Hague, November 4, 1650, was the son of William II., Prince of Orange, by Mary, daughter of Charles I. He was born to vast pretensions, though his party was for some time kept in check by the influence of Cromwell. The states of Zealand elected him 'first noble,' in virtue of which title he entered the States-General as a deputy. In 1672 the political situation was so far changed that W. was unanimously appointed Captain- and Admiral-General of the United Provinces (February 24), and immediately faced the allied English and French. The allies at last changed their tactics, and offered to erect W. as despotic ruler in his country, but he resisted such proposals. For political reasons W. then married his cousin, the Princess Mary, daughter of the Duke of York; but it was only after several years that this union proved fortunate in a domestic sense. In the following year (1678) the treaty of Nimeguen put an end for a time to the aggressive policy of Louis XIV., and the Orange defender of Protestantism obtained a temporary increase of popularity in England. At the accession of James II. he aided him against Monmouth, but he soon found his interests imperilled by connection with a Catholic king who aimed at absolute monarchy, and Holland became the refuge and resort of Protestant intriguers. The king's conduct at last causing universal discontent, W. was invited to England, and landed at Torbay with 15,000 men, November 5, 1688. The country was his at once, and James fled to France. A Convention was assembled on January 22, 1689, and passed more than a fortnight in arranging a new constitution. In partial submission to the peremptory demands of W., the law-makers departed from their intention of making him owe all his authority to the queen his wife. He was made king, and the reign of William and Mary was inaugurated on a satisfactory basis (February 13). The Scottish Highlanders, however, continued true to James, and of Ireland the deposed monarch had almost entire possession. In 1690 matters were nigh settled by William's victory of the Boyne (July 1), and James again took refuge in France; but the English were checked before the gates of Limerick, and it was reserved for Ginkell to restore peace to Ireland in the following year. Meantime, the death of Dundee had left the Highlanders without a competent leader, and a sullen quiet was brought about in the North, partly by the atrocious massacre of Glencoe (1692). In 1695, the death of Queen Mary diminished her husband's influence, and leaving factious opposition at home, he had to maintain unequal strife with Louis, until the Treaty of Ryswick was brought about by sheer exhaustion on both sides (September 1697). A partition treaty regarding Spain was violated by Louis, who took the throne of that country for his grandson, the Duke of Anjou; and the French king, on the death of James II., acknowledged his son as successor. The English, enraged at this, were making preparations for a powerful invasion, when W. was thrown from his horse while hunting, and died March 8, 1702. His career was one of incessant and strenuous activity, and he carried himself victoriously amidst immense difficulties and numerous discomfitures by a certain cold magnanimity and sullen heroism. The predominant motive of his foreign policy was resistance to the aggressive and tyrannous policy of Louis XIV. To this he was pledged as a Dutch stadtholder, long before he became King of England, and there is no doubt that he accepted the latter dignity not from a vulgar ambition to win a great throne, but to wield a potent weapon in his conflict with French despotism. If, on the one hand, this policy dragged England more thoroughly than before into the circle of European politics, and forced upon her a series of military enterprises not necessary to her welfare, Englishmen, on the other hand, cannot but feel grateful to the ruler who accepted the throne under conditions that secured them a free constitution, with political institutions capable of receiving (as they have received) indefinite improvement without danger of destruction. The sacred principle of toleration both in things civil and in things ecclesiastical was firmly established, though its full bearings and application were not clearly apprehended. Extreme fanatics hated him—Covenanters in the North and High Churchmen in the South—but the great mass of moderate and reasonable Protestants felt that he was a thoroughly practical and inflexibly just sovereign. That he loved, trusted, and advanced his countrymen is not greatly to his discredit. They were loyal to

him, and not disloyal to England. He could not become an Englishman, but he could act like one. His temper was indeed cold, but the nobler passions of man were in him deep and strong. Moreover, he had that stern love of truth, honour, and right that distinguishes a moral hero. Few greater kings have ever ruled in England. See Trevor, *Life and Times of W. III.* (2 vols Lond. 1835–36); Vernon, *Court and Times of W. III.* (3 vols. Lond. 1841); Macaulay, *History of England* (1849–55); and Ranke's *Englische Geschichte vornehmlich im 17 Jarhundert* (6 vols. 1859–67; 4th ed. 1877; Eng. trans. Oxf. Clar. Press 1875).—**W. IV.**, King of Great Britain and Ireland, third son of George III. and Queen Charlotte, was born on August 21, 1765. His education was entrusted to Dr. Magendie, and afterwards to Colonel Bude, till, in 1779, his early likings were gratified, and he entered the navy as midshipman on board the *Prince George*. After seeing active service under Admiral Rodney against the French, Spaniards, and Americans, Prince W. returned home, spent two years on the Continent, and was made a lieutenant in 1785, and a captain in the following year. He now served under Nelson in the W. Indies, but his insubordination, and the difficulty of punishing a prince of the royal blood, practically ended his professional career. In 1789 he was made Duke of Clarence and St. Andrews, and Earl of Munster; in 1801 he had risen to be Admiral of the Fleet; and he still showed great interest in naval affairs in the debates of the House of Lords. Since 1791 he had been living in retirement with a famous actress, Mrs. Jordan, by whom he had a family of ten children. With reluctance he abandoned a twenty years' connection, but political grounds demanded it, and on the 11th July 1818 he married Adelaide, eldest daughter of the Duke of Saxe-Meiningen. The death of the Duke of York (1827) made W. heir-presumptive to the throne, and on the death of George IV. he became king, June 26, 1830. The French Revolution of that year fanned the discontent at home, and the agitation for reform had begun. W. favoured the demand, which was successful (4th June 1832) only on the resignation of the Duke of Wellington. The rest of W.'s reign was taken up by prosecuting reforms in detail, though the king was rather alarmed at the result of the changes. 1833 saw the abolition of slavery, and there followed reforms in the poor laws, in town councils, and in the Irish Church. After a short illness, W. died June 20, 1837. The two children of Queen Adelaide having died in infancy, he was succeeded by his niece Queen Victoria. Devoid of anything like genius, W. was characterised by good sense. He was, as Thackeray said, 'a man,' and his people always loved their 'sailor king.' See Harvey's *Life of Peel* (Lond. 1852), the Duke of Buckingham's *Courts of W. IV. and Victoria* (Lond. 1861); and the *Greville Memoirs* (2d ed. Lond. 1874).

Will'iam the Lyon, King of Scotland, sometimes also called W. the Ruddy and W. the Rough, succeeded his brother, Malcolm IV., in 1165. His surname is supposed to have arisen from the fact that he substituted a lion for the old dragon in the royal arms of Scotland. W. renewed the contest of David and Malcolm IV. with the English kings about Northumberland, and while invading England he was captured at Alnwick Castle, July 13, 1174, as he rode under cover of a mist with a small party of knights. Henry II., who sent him to the castle of Falaise, in Normandy, now pressed hard the claim of English suzerainty on the captive king, and W. was liberated only on a promise of vassalage. This bargain held for fifteen years, till Richard I., needing money for the crusades, revoked the claim on payment of 10,000 merks. The appointment by W. of a bishop of St. Andrews, in opposition to one chosen by the clergy, involved him in a quarrel with the Church, till the death of the Pope brought peace. W. died in 1214, after a reign of forty-nine years. He was the first Scottish king who formed an alliance with France. See Burton's *History of Scotland*, vol. ii.

Will'iam, Prince of Orange, Count of Nassau, and first Stadtholder of the United Netherlands, was born at Dillenburg 16th April 1533. He was the eldest son of Wilhelm, Count of Nassau-Dillenburg, and at the age of eleven inherited from his cousin René, son of his father's elder brother Heinrich, the family estates in Luxembourg, Brabant, Flanders, and Holland, and the principality of Orange. Though his father was a Protestant, he was brought up as a Catholic at the court of the Queen Regent, Maria of Hungary, at Brussels, and at the age of fifteen entered the service of Karl V. as page. The Emperor noticed his great promise, and gradually made him his most intimate confidant, placing him in 1555, at the age of twenty-two, in command of the Imperial army on the French frontier. Karl, on his abdication, recommended him warmly to Philip, in whose favour he remained for some time. It was he who concluded with France the peace of Cateau-Cambresis, for whose fulfilment he himself became one of the four hostages. He seems to have gained the favour of Henri II., who confided to him, while they were together on a hunting-party one day, his scheme for exterminating 'that accursed vermin' the Protestants. W. himself had as yet no decided leaning towards Protestantism, but the extreme ferocity of the plot struck him with abhorrence. He had, however, enough policy to conceal his aversion, and so gained his historic appellation of 'the Silent,' in no wise due to him on general grounds, since he was by nature gay and communicative. Returning to Brussels, he took his acknowledged place as leader among the *grands seigneurs* of the country. Wealthy by inheritance and by the dowry of his first wife, Anne of Egmont, he led a life of magnificent profusion far beyond even his great means. But troubles gathered fast round the country. The establishment of the new bishoprics (1560) and the tyranny of Cardinal Granvelle formed the signal for the commencement of the struggle. The united remonstrances of W., Egmont (q. v.), and Hoorn, ultimately supported by the Regent, Margaret of Parma, procured the withdrawal of Granvelle; but this concession was nullified by the establishment of the Inquisition, the true cause of the revolt. Finding a rupture imminent, W. determined at all hazards to maintain the cause of freedom and justice. He was not one of the original Gueux (q. v.), and he did not approve of all their proceedings, but Granvelle and Philip's other councillors had penetration enough to recognise in him an opponent more redoubtable than all the other leaders of the popular party put together. He recognised his danger, and when, in 1567, Alva (see ALBA) was appointed governor of the Netherlands, and placed in command of a crushing force of Spanish troops, W. withdrew to Germany, leaving Egmont and Hoorn to meet the fate which he had in vain tried to persuade them to avoid. He now replaced his former extravagance by the most rigid economy, but plunged deeper into debt so as to raise and equip armies for the rescue of his oppressed country. In 1568 his brother, the gallant Louis of Nassau, invaded Friesland, and he himself marched an army of 30,000 men into Brabant. Louis was routed by Alva at Jemmingen, but that wily commander refused to give battle to Orange, who was forced from lack of money to retreat and disband his army. In the next year he and his brothers brought their swords to the assistance of Coligny and the French Huguenots, but did not make another attempt upon the Low Countries until 1572. He had issued letters-of-marque to a number of privateers, called, in imitation of the Gueux, 'beggars of the sea,' and these in April 1572 captured the port and fortress of Brill. This was the first gleam of success which had fallen to the lot of the patriots, but it was soon to be overclouded. With an army of 24,000 men W. crossed the Rhine. Holland, Zeeland, Guelderland, Overyssel, and Utrecht appointed him stadtholder for Philip, to whom they had not yet renounced allegiance. The St. Bartholomew Massacre, however, crushed all hopes of aid from France, and the Spanish troops overran the whole of the North Netherlands, taking fortress after fortress. Haarlem was taken (July 1573) after a siege of seven months, and was devoted to fire and sword with the cruelty which characterised the Spanish soldiers above all others even in that cruel age. Alkmaar, however, held out, and the Dutch gained some naval victories. The 14th of April 1574 witnessed the most cruel blow of the whole war, alike to Orange personally and to the patriotic cause, in the defeat at Mooker-Heide, where Louis and Henry of Nassau, the prince's two brothers, who were marching northwards with aid from France, were both slain by the Spaniards under Avila. In the autumn, however, the cause revived. Leyden was relieved on the 3d of October by W. and the French admiral Boisot, who had driven the Spaniards away by breaking the dikes and flooding the surrounding country. It had borne famine and the other horrors of a siege with a heroic constancy which has rendered it for ever famous in history. Conciliation was tried fruitlessly at the conference of Breda (March 1575), and in the next year it seemed as if there were some possibility of the five Southern provinces which had remained faithful to Spain joining their Northern sisters. The *Pacification of Ghent*, however, was of

short duration; for, though it withstood the *Perpetual Edict* by which Don John of Austria, Alva's successor, attempted to conciliate the Walloon provinces, and though it even survived the disastrous defeat suffered by the patriots at Gembloux (31st January 1578), it could not resist the politic measures of Alessandro Farnese, who succeeded Don John, and the Southern provinces abandoned their last chance of freedom. Gradually the Spaniards lost their hold upon the North, and the division became more complete. The *Union of Utrecht*, which established the Dutch Republic, was signed on the 23d January 1579, and the United Provinces declared their independence on the 26th July 1581. W. remained practically at the head of affairs, though for some time the Archduke Mathias of Austria was the nominal ruler, and was succeeded by the Duke of Anjou, who had not even the nominal rule of Holland and Zeeland, where the Prince of Orange was supreme. Anjou was expelled in 1582, and his successor had not been chosen when the death of W. occurred. As early as 1580, Philip had offered a reward of 25,000 crowns and a patent of nobility for his assassination, which was more than once attempted. At last, on the 10th July 1584, he was shot in his own house by a man named Balthazar Gérard, half ruffian, half fanatic, whose only good quality seems to have been the almost superhuman courage which he evinced in enduring the inhuman tortures with which he was executed. So died one of the greatest of all patriots, a man fit to stand in the scale of character beside Washington and above Cromwell; while in ability, whether political or military, he fell in no way short of either. He had publicly professed the Calvinist faith in 1572, and showed the most earnest and sincere piety, but was no more bigoted as a Protestant than he had been as a Catholic. He was four times married, his second wife being Anne of Saxony, his third Charlotte of Bourbon, and his fourth Louise de Coligny, the daughter of the great French Huguenot. Two of his sons, Maurice and Frederic Henry, succeeded him in turn as stadtholder. See Motley's *Rise of the Dutch Republic* (Lond. and New York 1856), which may almost be called a biography of W. See also Gachard's *Correspondance de Guillaume le Taciturne* (Brussels 1847–56), Klose's *Wilhelm I., von Oranien* (Leip. 1864), Hermann's *Wilhelm von Oranien* (Stuttg. 1873), and Juste's *Guillaume le Taciturne d'après sa correspondance et les papiers d'état* (Bruss. 1875).

Will'iam and Mary College, at Williamsburg, in Virginia, the oldest college next to Harvard in the United States, received a charter in 1693 from William and Mary at the instance of Dr. James Blair, the commissary of the Bishop of London. Certain revenues were at the same time devoted to it, which were lost at the Revolution. It has a library of 4900 vols., and (1875) had 65 students and 7 professors.

Will'iams, Edward (Cymr. *Iolo Morganwg*), born at Llancarvan, Glamorganshire, in 1745; with Owen Jones and Pughe edited the *Myvyrian Archæology* (3 vols. 1801–7), and himself published, among other works, *The Fair Pilgrim, a Poem translated from the Welsh* (1792). To this he appended specimens of Druidical 'Triads,' which, after a long-protracted controversy and on the non-production of their MSS., are commonly looked on as a literary forgery. A friend of Southey, W. by trade was a stone-mason, and worked for some years in London, but died at Flemingstone, Glamorganshire, 17th December 1826, leaving a posthumous Welsh work, *Secrets of the Bards of the Isle of Britain* (1829). See E. Waring's *Recollections of E. W.* (1850).

Will'iams, John, the 'Martyr of Erromanga,' one of the greatest of modern Christian missionaries, was born at Tottenham High Cross, near London, January 29, 1796, and began life as an ironmonger's apprentice. In 1816 he sailed for the South Sea Islands, under the auspices of the London Missionary Society, and with the exception of about four years (1834–38), which he spent in England, the rest of his life was uninterruptedly devoted to the introduction of Christianity and civilisation among the Polynesians. At Rarotonga he constructed with his own hands a vessel of between 60 and 70 tons burden, with which he succeeded in visiting Tahiti on the one hand and the Navigators Islands on the other. No book of its kind ever attained so great a popularity as W.'s *Narrative of Missionary Enterprises in the South Sea Islands* (Lond. 1837), and it will long retain its value as a simple and manly record of a heroic life, and a trustworthy history of the most remarkable instance of savage communities being rapidly and radically transformed under the direction of a purely moral impulse. W. returned to the South Seas in 1838, and on November 20, 1839, he was massacred along with a fellow-missionary by the still barbarous natives of Erromanga. See John Campbell, *The Martyr of Erromanga* (Lond. 1842); and Ebenezer Prout, *Memoirs of the Rev. J. W.* (Lond. 1843).

Will'iams, Monier, son of a Surveyor-General of the Bombay Presidency, was born at Bombay, 12th November 1819, and after studying at King's College, London, and Balliol, Oxford (1838), gained an Indian writership and entered Haileybury College. In spite of a brilliant career there, circumstances forced him to resign his appointment, and returning to University College, Oxford, he was elected Boden scholar (1843), graduating B.A. in 1844. He occupied the Sanskrit chair at Haileybury (1844–58), was two years Oriental master at Cheltenham College, and in 1860 defeated Max Müller in a candidature for the Boden Sanskrit professorship at Oxford. His tenure of this office has been distinguished by his two visits to India (1875–76), there to collect subscriptions to found at Oxford an Indian Institute, a task that he has successfully achieved. Among his works are *A Sanskrit Grammar* (1846; 4th ed. 1877), an *English-Sanskrit Dictionary* (1851), *Rudiments of Hindustani* (1858), *Indian Epic Poetry* (1863), *A Sanskrit-English Dictionary* (1872), *Indian Wisdom* (1875), *Hinduism* (1877), and *Modern India and the Indians* (1878).

Will'iams, Roger, the founder of the state of Rhode Island, born in Wales about 1599; passed from Sutton's Hospital to Pembroke College, Cambridge, in 1623, and graduated in 1627. He obtained a benefice in Lincolnshire, but, embracing 'Separatist' views, left England in 1630 for America. There he became assistant to the Rev. Ralph Smith, of Plymouth, supporting himself meanwhile by manual labour, and bestowing much pains on the study of the Indian language. W. left Plymouth for Salem in 1633, and became pastor there in 1634, but the year after he withdrew from communion, and in January 1636 he was banished from the Massachusetts Plantation for his 'defamation both of the magistrates and churches.' About the 29th of May he founded the town of Providence as a 'shelter for persons distressed for conscience,' who should be 'ruled by the majority only in civil things,' and formed a 'covenant of peaceful neighbourhood' with the Indian tribes. In 1643 W. visited England, and through Sir Henry Vane secured a charter for his plantation, which was confirmed on his second visit to England in 1651. He remained in London till 1654, becoming acquainted with Cromwell and Milton, and in that year returned to Providence. From 1654 to 1657 W. acted ably as president of the colony, and in 1672 he refused to sanction the exclusion of Quakers from Rhode Island. He died at Providence in April 1783. A statue of W. has been erected by Rhode Island in the Capitol at Washington. See W.'s sixty-five *Letters* to the two Governors Winthrop (1863), his *Works*, edited by Reuben Aldridge Guild (6 vols., 1866–75), and the biographies by J. D. Knowles (1833), W. Gemmell (1846), and R. Elton (Lond. 1852), also M. Dexter's *As to R. W. and his Banishment from the Massachusetts Plantation* (Bost. 1876).

Will'iams, Rowland, D.D., born at Halkyn, Flintshire, 16th August 1817, from Eton (1828–36) passed to King's College, Cambridge, of which, having graduated in 1841, he became a fellow and tutor. Taking orders, he was appointed chaplain to the Bishop of Llandaff, vice-principal and Hebrew professor at Lampeter College (1850), select preacher to Cambridge University (1854), and vicar of Broadchalk, Wiltshire (1859). A foremost member of the Broad Church party, he was condemned by the Court of Arches (1862) for his paper on Bunsen's 'Biblical Researches' contributed to the famous *Essays and Reviews*, and having resigned his professorship prior to the reversal of that sentence by the Privy Council (1864), resided thenceforth at his vicarage down to his death there, 18th January 1870. Among his works were *Rational Godliness* (1855), *Christianity and Hinduism* (1856), *The Hebrew Prophets, a New Translation* (2 vols. 1868–71), and *Psalms and Litanies* (1872). See his *Life and Letters* (2 vols. Lond. 1874) by his widow, who has also edited *Stray Thoughts from the Note-Books of R. W.* (Lond. 1878).

Will'iams, Sir William Fenwick, Bart., K.C.B., a distinguished English general, was born at Halifax, Nova

Scotia, 4th December 1800, entered the Royal Artillery in 1825, and rose to the rank of first-lieutenant in 1827 and of captain in 1840. For service in Turkey he was brevetted major in 1843, and after taking part in the Turco-Persian Conference at Erzerum in 1847 was English commissioner for the settlement of the Persian boundary dispute in the year following. He received the Order of the Bath in 1852, and was nominated British Commissioner with the Turkish army in the East in 1854. Promoted brigadier-general, he heroically defended Kars with a Turkish garrison of 17,000 against Mouravieff with a greatly superior Russian force. The siege, which began on 16th June, lasted till 30th November 1855, when famine forced the general into surrender. On his return to England W. received, among other honours and rewards, a baronetcy with a life pension of £1000 a year, the rank of K.C.B., and the freedom of London City. He was returned to Parliament as a Liberal for Calne in 1856, and again in 1857, but retired in 1859, when he was appointed to the command at Woolwich. From 1860 he commanded the British troops in Canada, and in 1870 succeeded Sir R. Airey as Governor-General of Gibraltar. He resigned the post in 1875, and in 1877 retired from the army.

Will'iamsburg, the capital of James county, Virginia, U.S., on an elevated plateau between the James and York rivers. Though founded as early as 1632, W. contains little of interest except *William and Mary College* (q. v.). Its lunatic asylum, opened in 1773, is the oldest institution of the kind in the country. Pop. (1870) 1392. On May 5, 1862, W. was the scene of a fiercely contested battle in which the Federal troops ultimately came off victors.

Will'iams College, in Berkshire county, Massachusetts, U.S., was founded in 1793 in accordance with the will of Colonel Ephraim Williams, who fell near Lake George in 1755. It had (1875) 13 professors, 136 students, a library of 16,000 vols., and extensive and convenient college buildings. It has always shown a most praiseworthy zeal for science, the first observatory in the country having been erected here by Professor Hopkins. Its funds amount to $300,000.

Will'iamsport, a city of Pennsylvania, U.S., on the W. branch of the Susquehanna river, 202 miles N.W. of Philadelphia. It contains 32 churches, 3 public parks, &c., and has extensive foundries and boiler-works, but its importance is chiefly due to the lumber-trade of the Susquehanna, upwards of 900,000 logs being floated down to it annually from the upper reaches of the river. Pop. (1877) 16,030.

Will'iamstown, an important seaport of Victoria, on the S.W. shore of Hobson's Bay, 8 miles from Melbourne, with which it is connected by rail. Besides an extensive shipping trade, it has shipbuilding yards, patent slips, and a stone graving-dock capable of admitting vessels 500 feet long. The harbour is protected by heavy batteries. Pop. 8000.

Will'ibrord, St., 'Apostle of the Frisians,' born in Northumbria about 658, after a childhood passed at Ripon monastery, then ruled by St. Wilfrith, and twelve years of study in Ireland under St. Egbert, sailed in 690 for Friesland with twelve brother monks, to accomplish the work of conversion begun by Wilfrith (q. v.). Pippin of Herstal, who in 689 had wrested from Radbod, the Frisian king, a part of his territory, favoured the undertaking, and in his first visit to Rome (693) W. also received the sanction of Pope Sergius I., who three years later consecrated him Bishop of Utrecht under the name of Clemens. As such he laboured with high success among the Frankish subjects, with less among Radbod's, as also in Denmark and on Heligoland (699). The outbreak of war with Karl Martel (714) forced him to withdraw for a time to his monastery of Echternach, where, having meanwhile renewed his labours on Radbod's death (719), he died 7th November 739. See Thijm, *Der Heilige W.* (Münst. 1863), and a *Life of St. W.* (Lond., Burns & Oates, 1877).

Will'is, Nathaniel Parker, an American author, was born at Portland, in Maine, January 20, 1807. While still an undergraduate at Yale College, W. wrote a number of poems for his father's paper, *The Boston Recorder*, which were reprinted by S. G. Goodrich as *Sketches* (Bost. 1827), and from that date onwards his pen was never idle. Having spent six years (1831-37) in European travel, he settled down with his English wife, Mary Leighton Stace, on a beautiful estate, Glenmary, on the Susquehanna; but by 1844 he was back in England a sorrowing widower. On his return in 1846 to the United States, he married a daughter of the Hon. Joseph Grinnell of New Bedford, and established a new home at Idlewild on the Hudson, where he died, January 21, 1867. W., in spite of an almost lifelong struggle against consumption, kept up a remarkable activity in the lighter forms of literary production. He had been connected at one time or other with *The American Monthly Magazine*, *The New York Mirror*, *The Corsair*, *The New Mirror*, *The Evening Mirror*, and *The Home Journal*; he had contributed freely to English periodicals; and had published a large number of sketches, tales, and essays, such as *Inklings of Adventure* (1836), *Letters from Under a Bridge* (1840), *Hurry-graphs* (1851). He published a complete edition of his then extant works in 1846 in one volume.

Will'ow (*Salix*), a large genus of trees and shrubs belonging to the natural order *Salicinia*. The genus is predominant in the Arctic and N. temperate zones, becoming rarer in the tropics and southern hemisphere, and is not found in Australia or the Pacific Islands. It includes plants ranging from trees nearly 100 feet high to dwarf shrubs only rising an inch or two above the soil. From their long and interlacing roots, willows are invaluable to protect and fix the banks of rivers. Along roads, brooks, and in meadows they are often grown as pollards. The inner bark is tough and fibrous, and in N. America fishing-nets and lines are made of it. The bark of several species is bitter, containing a crystalline substance called *Salicine* (q. v.). Various species have already been noticed in articles OSIER and SALLOW, and of the large number which do not fall under these categories, a few only of the most utilitarian can be referred to here. The White W. (*S. alba*), spread through Europe eastward to the Himalaya, and often seen in marshy meadows in Britain, forms a large tree; its wood is light and elastic, available for carpenters' and wheelwrights' work, and its bark is serviceable for tanning. A series of hybrids between this and the Crack W. (*S. fragilis*), which bear the name of Bedford W. (*S. Russelliana*), are useful, quick-growing timber trees, and the bark contains more tannin than that of oak. *S. daphnoides* of Mid Europe and Northern Asia is remarkable for rapid growth. It is often chosen to fix the ground of railway embankments on sandy ridges or slopes. Its foliage furnishes cattle-fodder. The wood of *S. Humboldtiana*, a tree of about 50 feet in height, common in S. America, is much used for yokes and other implements. The Weeping W. (*S. Babylonica*) is widely distributed in Asia, and has elsewhere entered largely into cultivation as a shade-tree and for embellishments. *S. capensis* of S. Africa and *S. longifolia* of N. America also have long flexible withes. The sweet-scented male catkins of *S. Ægyptiaca* are used in the East in the preparation of kalaf, a liquid used as a stimulant and carminative; and in N. America a decoction of the roots of *S. nigra* is considered purgative and febrifugal.

Will'ow Moth (*Caradrina cubicularis*), a species of *Lepidopterous* insect, the larvæ of which feed upon grain, and chiefly upon wheat. It is of a dun or grey colour, the wings being apposed over the back in a state of rest. The hinder wings are pearly white. The larva is of a dull red colour often mixed with green, and the pupa or chrysalis is brown. The larvæ exist through the winter, and the pupa state is assumed in March or April.

Wil'mington, a city of Delaware, U.S., 28 miles S.W. of Philadelphia by rail, between the Brandywine and Christiania creeks, which join to form an affluent of the Delaware River, meeting it 1½ miles below W. The town has 50 churches and 5 daily and 8 weekly newspapers. In 1873 its manufactures were estimated at £21,000,000, consisting chiefly of machine work, $2,200,000; morocco and other leather, $2,050,000; foundry work and car wheels, $2,000,000; railroad cars, $2,000,000; carriages and wagons, $1,400,000; iron, $1,300,000; iron shipbuilding, $1,200,000; paper, $1,200,000; powder and chemicals, $1,200,000; flour and meal, $1,200,000; cotton goods, 1,100,000. Pop. (1876) 36,890.

Wil'mington, the largest town and chief seaport of North Carolina, U.S., on the E. bank of Cape Fear River, 30 miles from its influx into the Atlantic Ocean, 98 miles S.S.E. of Raleigh by rail. Vessels drawing not more than 16 feet of water can load here, but the harbour is now (1879) being considerably

deepened. W. has 22 churches, 12 schools, a theatre, and 5 newspapers (3 daily). Its exports in 1875 amounted to $10,000,000. They consist of lumber, shingles, cotton, and especially of naval stores, for which W. is said to be the leading market of the world. In 1877, of British vessels in direct trade with Britain, there entered the port 32 of 10,428 tons, with cargoes valued at £1035 (25 out of the 32 were in ballast); and cleared 43 of 13,575 tons with cargoes valued at £171,058; and in the carrying trade with other countries, there entered 30 of 8548 tons with cargoes valued at £2175, and cleared 19 of 5341 tons, with cargoes valued at £18,444. Pop. (1870) 13,416. W. was one of the chief ports visited by the blockade runners during the Civil War, and it was the last port open to the Confederates.

Wil'na. See VILNA.

Wil'son, Alexander, usually styled 'the American ornithologist,' was born at Paisley 6th July 1766. His youth was spent in weaving, peddling, and poetising. In 1790 he ventured to publish a volume of prose, and in 1792 his *Watty and Meg* had the honour of being ascribed to Burns; but in 1793 he was imprisoned for three days for lampooning one of the Paisley magistrates, and smarting under the disgrace he decided to leave the country. He landed at Newcastle in the United States July 14, 1794. From weaving and peddling he soon took to teaching, and acted as schoolmaster at various places; at Milestown, where he appears to have got into difficulty through a love affair, at Bloomfield, and at Kingsessing on the Schuylkill. An acquaintance formed at Kingsessing with William Bartram having stimulated his interest in American birds, he determined to collect and describe them, and for this purpose undertook a number of journeys in parts of the country that were then comparatively unexplored. The first volume of his great *Ornithology* was published in 1808 by Bradford of Philadelphia, and the second in 1810; other five appeared before his death, August 3, 1813; and an eighth and ninth were edited by George Ord in 1814. A continuation was executed by Lucien Bonaparte (Phila. 1825–33). W.'s *Poems* were published at Paisley in 1816 and at Belfast in 1844. *The Foresters*, a versified narrative of his journey to the Falls of Niagara, which first appeared in the *Portfolio*, has been frequently reprinted. See the Lives of W. prefixed to the Belfast edition of the *Poems* and to Sir William Jardine's edition of the *American Ornithology* (1832); Lucy Brightwell, *Difficulties Overcome* (Lond. 1860); Allan Park Paton, *W. the Ornithologist: a New Chapter in his Life* (Lond. 1863), and *The Verse and Miscellaneous Prose of A. W.*, edited, with memorial-introduction and notes by the Rev. A. B. Grosart (2 vols. Gardner, Paisley 1876).

Wil'son, Daniel, LL.D., a well-known archæologist, was born at Edinburgh in 1816, educated at the University of his native city, and after having been for some years secretary to the Royal Society of Antiquaries in Scotland, became in 1853 Professor of History and English Literature in the University of Toronto. He was president of the Canadian Institute (1859–60), and edited for four years the *Journal of the Canadian Institute*. His works are *Memorials of Edinburgh in the Olden Time* (2 vols. Edin. 1846–48; new ed. Edin. T. C. Jack, 1875); *Oliver Cromwell and the Protectorate* (ed. 1843); *The Archæology and Prehistoric Annals of Scotland* (ed. 1851; enlarged ed. 2 vols. 1863); *Prehistoric Man, Researches into the Origin of Civilisation in the Old and the New World* (2 vols. 1862; 3d ed. rewritten, 1876); *Chatterton, a Biographical Study* (1869); *Caliban, the Missing Link* (1873); and a volume of poems, *Spring Wild Flowers* (2d ed. 1875).—**George W.**, younger brother of the preceding, was born in Edinburgh, February 21, 1818. Educated at the High School and Surgeons' Hall of his native city, he was successively assistant to Professor Christison (1837) and Dr. Thomas Graham, Professor of Chemistry in University College, London (1838), extra academical lecturer on chemistry in Edinburgh (1840), a professor of technology in the University of Edinburgh, as also curator of the Industrial Museum (1855). He died November 22, 1859. W. was a man of exquisite beauty of character and grace of mind. He had the fancy of a poet and the luminous intellect of a savant. His chief works are *Life of Cavendish* (1851), *Life of Dr. John Reid* (1852), *The Five Gateways of Knowledge* (1856), and *Memoir of Edward Forbes* (1861) in conjunction with Archibald Geikie. See a Memoir by his sister, Jessie Aitken Wilson (Edinb. 1860).

Wil'son (Latinised *Volusenus*), **Florence**, a Scottish scholar and poet, was born near Elgin about 1500, and educated at King's College, Aberdeen. Proceeding to England he obtained the favour of Cardinal Wolsey, whose nephew he accompanied to Paris as tutor. On the death of Wolsey (1530) he found another patron in the learned Cardinal du Bellay, Archbishop of Paris, and was finally appointed by Cardinal Sadolet master of the public school of Carpentras. While here he wrote his famous dialogue, *De Animi Tranquilitate* (Leyden 1543), a monument of his classical erudition and the beauty of his Latin style. It contains several pieces of original Latin verse, which rival Buchanan's in elegance if not in strength. W. died at Vienne, in Dauphiny, about 1547.

Wil'son, Horace Hayman, a distinguished Sanskrit scholar, was born in London in 1786. He went to India in 1808 on the medical staff, but till his departure from Calcutta he was almost continuously employed in the Mint. Apart from his devotion to Sanskrit literature, he made himself intimately acquainted with the modern life of the Hindus, and took great interest in their social improvement. In 1833 he returned to England to be the first Boden Professor of Sanskrit at Oxford University, and shortly afterwards he was appointed librarian at the East India House, both which offices he held till his death, 8th May 1860. His published works, mostly on Sanskrit and kindred subjects, are very numerous. They were collected in 12 vols. (Lond. 1864–70), edited by Rost and Hall.

Wil'son, John, more familiarly known by his *nom de plume* of 'Christopher North,' was the son of a wealthy manufacturer, and was born at Paisley, May 18, 1785. Educated first in the parish manse of Mearns, next at Glasgow University for four years, he entered finally Magdalen College, Oxford, in 1803. There he gave good promise of his future career, and gained the Newdigate Prize in 1806; but his college achievements were chiefly athletic. In the following year he graduated, and soon after he bought Elleray, a beautiful little estate on the side of Windermere. In this district he had frequent intercourse with Coleridge, Southey, De Quincy, and above all, Wordsworth, the founder of the school of poetry to which W. in style belongs. To Coleridge's *Friend* he contributed a few essays. In 1810 he made a fortunate union with Miss Jane Penny, a beautiful, spirited, and accomplished woman, who had a powerful influence for good on her boisterous husband. Two years later appeared his *Isle of Palms*, a poem only read for half-a-dozen descriptive passages; and in 1816 he made a more serious essay with *The City of the Plague*. His private fortune was about this time curtailed by the misconduct of a relative. At Edinburgh, after passing advocate at the Scotch bar in 1815, he at once secured occupation and notice by starting *Blackwood's Magazine* (1817), a periodical intended to counteract the despotic Whiggery of Jeffrey's *Edinburgh Review*. W. was never nominally the editor, but was for long the principal contributor, sometimes writing nearly the entire monthly number. It is not wonderful that with support from such bright spirits as Lockhart, Hogg, and Maginn, he should have established a wide sway in literature. 'Kit North' was soon as well known as Jeffrey. In society and in his magazine, however, the rollicking litterateur many a time offended the minor laws of society. In 1820 he succeeded Dr. Thomas Brown in the chair of Moral Philosophy. The contest was singularly acrimonious, and it was W.'s misfortune to be opposed by an incomparably more exact thinker than himself, Sir William Hamilton. Politics decided the day. The Tory defeated the Whig. But it may at least be said for W. that he carried his genius into the professor's chair; and if he did not evolve a new ethical theory, he irradiated his subject with a stronger and richer eloquence than it had ever before received in a Scottish University. Seventeen happy and busy years went by, during which were written three tales, *Lights and Shadows of Scottish Life* (1822), *Trials of Margaret Lindsay* (1823), and *The Foresters* (1824), all abounding in the happiest descriptions of Scottish scenery. In 1837 the death of his wife almost broke his spirit. For a time he felt unfit for his accustomed labours; but he published in 1841 an *Essay on Burns*, and in 1842 *The Recreations of Christopher North*, a series of collected essays in three volumes. In 1851 he received a Crown pension of £300, and in the following year broken health compelled him to resign his chair. For two years he was laid aside, and he died in the city in whose streets he was known so well, April 3, 1854. In the collected writings of

Christopher North, edited by his son-in-law, Ferrier (12 vols. 1855-58), there is much that has lost the bloom so charming in the magazine pages, yet in them we have a literary influence that was second only to Scott's. He was by turns fierce and tender, poetical and coarse, broad in his literary sympathies, and vindictive in his political partisanship, but his work was always strong, full of imagination, and—a necessity for his magazine—delightfully readable. Now-a-days his poems and prose tales receive little attention, and his reputation rests on the classic *Noctes Ambrosianæ*, in which the early readers of *Blackwood* revelled with Christopher and his cronies as they mingled the poetry of laughter with the fierce gibings of party spirit over the steaming hippocrene. A condensed edition—*The Comedy of the Noctes Ambrosianæ*—was edited by Dr. Skelton in 1877. See *Christopher North: A Memoir of John W.*, by his daughter, Mrs. Gordon (1863; new ed. Thomas C. Jack, Edin. 1879).

Wil'son, Rev. John, D.D., F.R.S., missionary, philanthropist, and scholar in Western India, was born in 1804 at Lauder, Berwickshire, and educated at the University of Edinburgh. In 1828 he was sent out to Bombay by the Scottish Missionary Society, and in 1835 transferred his services to the General Assembly's India Mission. In 1843 he and his twelve colleagues in India joined the Free Church of Scotland. For forty-seven years W. was identified with progress of all kinds, spiritual, social, intellectual, and even administrative in Western India, more than any other man. As a missionary he founded two Christian colleges, established the first girls' schools, opened numerous boys' schools, and in vernacular as well as in English education was the pioneer; and the example was followed by the Government, which made him Vice-Chancellor of the University of Bombay. He made detailed tours all over Western and Central India from 1829 to 1839, which resulted in the establishment of vigorous missions, not only by his own Church, but by the Irish Presbyterians in Goojerat, and the United Presbyterians of Scotland in Rajputana. By pen, and voice, and personal influence, he caused or aided in the abolition of the slave-trade in Eastern waters and E. Africa; the stoppage of suttee and other iniquities encouraged by Brahmanism, the growth of toleration, and the protection by the legislature of the civil and religious rights of the natives. He founded a large native church and body of educated catechumens. As the friend of the successive Governors of Bombay and Governors-General of India, he was consulted on many political questions, from Lord Ellenborough's Proclamation of the Gates of Somnath, by Lord Elphinstone all through the Mutiny, by Sir Bartle Frere, and down to Lord Northbrook's trial of the ex-Gaikwar of Baroda. He was of essential service to his friend Dr. Livingstone in the last expedition of the heroic explorer of Central Africa, and it was W.'s students Chuma and Wykatane who brought home the remains. He aided Lord Napier in the Abyssinian expedition, two of his catechists, Gabru and Maricha Warka, having become the trusted counsellors of Prince Kassai of Tigré, the present *Negoos* or King Johannes of Abyssinia. As a man he was beloved by the natives, as well as Europeans, of all creeds and classes through four generations, so that he was affectionately known as W. *Kaka*, or 'Uncle W.' His life and influence purified English society in Bombay, and gave it a high ideal. As a scholar his most notable merit is that he was the first Englishman to expound the Zand literature of the Parsees from the original texts, and to decipher the Pali edicts of the first Buddhist Emperor Asoka, as graven on the rocks of Girnar, in the peninsula of Kathiawar, near Joonagurh. Like Mezzofanti, he had a marvellous genius for languages—Zand, Sanskrit, and their derived dialects; Arabic and Hebrew; Marathi, Goojarati, Hindi, Hindostani, and Persian. His familiarity with the most obscure characters and books of the Hindu sects enabled him in the Maharaj libel case to expose the adulterous practices of the Krishna priests (Vallabhacharyas), and to earn the gratitude not only of the High Court judges, but of the varied native communities of Bombay. His greatest book is *The Parsi Religion* (1842). He wrote *The Lands of the Bible*, still an authority on the Eastern Churches, which he had studied more profoundly and practically than any other English scholar at the time; *India Three Thousand Years Ago*, his most popular work; *Memoirs on the Cave-Temples of India*, *The Religious Excavations of Western India*, numerous missionary works in English and the vernacular languages of India, and a posthumous fragment forming one thick volume, *Caste*, on which he was occupied for many years. Dr. W. was summoned home to be Moderator of the Free Church General Assembly in 1870. On his death in Bombay in 1875, during the visit of H.R.H. the Prince of Wales, who desired to call on the venerable missionary, the whole city, from the governor to the humblest African whose liberty he had secured, followed the missionary to the grave. The citizens and the sacred town of Nasik had previously presented him with eulogistic addresses. The Asiatic Society of Bombay twice honoured him thus. His first wife, Margaret W., and his second wife, Isabella W. were, as pioneers of female education, as remarkable and beloved as W. See Dr. George Smith's *Life of John W., D.D., F.R.S., for Fifty Years Philanthropist and Scholar in the East* (Lond., Murray, 1878).—**Andrew W.**, son of the preceding, was born at Bombay in 1830, and studied at Edinburgh and Tübingen. He first attracted notice by a contribution to the *Edinburgh Essays* (1857) entitled *Infante Perduti*. W. subsequently edited the *China Mail* for three years, visited Japan when it was thrown open to Europeans, lived for a time in Southern China after the Chinese fashion, wrote *The Ever-Victorious Army*, a history of the campaign in which Colonel C. G. Gordon, now the Khedive's Governor in Equatorial Africa, suppressed the Tai-ping rebellion, was in America in the early years of the Civil War, and returning to the East edited the *Bombay Gazette*, and made a long journey through the upper valleys of the Himalaya, of which he has given a graphic and brilliant description in his *Abode of Snow* (1875). He has been a frequent contributor to *Blackwood* and other magazines. W.'s latest work (1879) is *Schiller* in the series of 'Foreign Classics for English Readers.'

Wilson, Sir Archdale, G.C.B., the Indian officer who commanded at the great siege of Delhi, was born at Didlington, Norfolk, in 1803. At sixteen he entered the Bengal Artillery, to the lustre of which he added at the siege of Bhurtpore, the affair of Lahore, and the capture of Delhi. After the successive deaths of Generals Anson and Barnard, General Reed succeeded to the command at Delhi in 1857. Finding his health unequal to the strain, that officer made W. brigadier-general, and resigned the command to his hands. That was at the time when the little British force on the Ridge was the besieged rather than the besiegers. What it wanted was a siege train of far-reaching guns. As an artilleryman W. saw this. Though never hopeful, though naturally weighed down by a sense of his responsibility, W. had the merit to trust the two men who finally took Delhi—Colonel Baird Smith (De Quincey's son-in-law) and Captain Alec Taylor. Hence the substantial justice of Lord Canning's order when Delhi fell, 'In the name of outraged humanity, in memory of innocent blood ruthlessly shed, and in acknowledgment of the first signal vengeance inflicted upon the foulest treason, the Governor-General in Council records his gratitude to Major-General W. and the brave army of Delhi. He does so in the sure conviction that a like tribute awaits them, not in England only, but wherever, within the limits of civilisation, the news of the well-earned triumph shall reach.' Made a baronet by patent, Sir Archdale W. was succeeded by his nephew, the present Sir Roland Knyvet of Delhi, on 9th May 1874. Sir John Kaye fairly states the facts of W.'s Delhi command in the 2d and 3d volumes of the *History of the Sepoy War*, but a better book is the *History of the Siege of Delhi, by an Officer who served there* (Dr. Ireland, it is said), and published by Adam and Charles Black (Edin. 1861).

Wil'son, Sir Robert Thomas, an English general, was born in London in 1777. He received the rudiments of a classical education at Westminster and Winchester, and at an early age (1794) obtained a commission in the 15th Light Dragoons, at that time serving in the Netherlands. Though the British forces returned home in 1796 he had already seen a good deal of hard service, and not long after he took part in the suppression of the Irish rebellion (1798), and was present in all the engagements of the campaign of the Helder (1800). We next find him with the Austrian army in Italy, with Sir Ralph Abercromby in Egypt (1801), and with Sir David Baird at the Cape of Good Hope (1805). As a member of Lord Hutchinson's staff he was a witness of the battles of Eylau and Friedland, and he was employed to convey despatches from St. Petersburg to England and from England back to St. Petersburg. In the Peninsular War he had command of the army of Portugal (1808-9), and rен-

dered effective service; but his next employment was again rather diplomatic than military, Lord Castlereagh sending him to Constantinople as attaché to Mr. Liston's mission. During the final struggle between Russia and the French he was present at the headquarters of the Russian army, took part in the battles of Lützen, Bautzen, Dresden, and Leipzig, his services being acknowledged by the presentation of the Order of St. George from the hand of the Emperor himself. In 1814 he served for a time in Italy, and in 1815 he assisted in the escape of Lavalette at Paris and was condemned to three months' imprisonment. The free expression of his opinions against the government action in regard to Queen Caroline caused him to be dismissed from the army (September 1821), but he was afterwards restored, attained the rank of general in 1841, and was governor of Gibraltar from 1842 to 1849. For a number of years (1818–31) he was Member of Parliament for Southwark in the Liberal interest. He died in London, 9th May 1849. W. wrote *History of British Expedition to Egypt* (Lond. 1802); *Inquiry into the Military Force of Britain* (1804); *Remarks on the Russian Army and Sketch of the Campaigns in Poland in* 1806 *and* 1807 (1810); *Narrative of Events during the Invasion of Russia by Napoleon* (1860), and *Private Diary of Travels, &c., in the Campaigns of* 1812–14 (2 vols. 1861)—the two last being edited by his nephew and son-in-law, Rev. Herbert Randolph. These works are in the main valuable contributions to the history of the times, and consist for the most part of the writer's personal experiences, narrated with no small liveliness and vigour. See *Life of Sir R. W. from Autobiographical Memoirs* (2 vols. Lond. 1862) also edited by Randolph.

Wil'ton, a market-town of Wiltshire, England, stands at the confluence of the Wiley and Nadder, 2½ miles W.N.W. of Salisbury by rail. Its church (1842) is a richly-decorated Lombardic structure, with a campanile 120 feet high; and near the town is the mansion of the Earls of Pembroke, with fine art collections, and a library where Sydney wrote his *Arcadia*. W. returns one member to Parliament, and has a celebrated carpet factory, employing 500 hands. Pop. (1871) 8865. The seat of a bishopric (909–1050), and the scene of Ælfred's defeat of the Danes (871), W. has dwindled as Old Sarum rose into importance.

Wilt'shire, or **Wilts**, an inland county in the S.W. of England, bounded N. and N.W. by Gloucestershire, N.E. by Berkshire, S.E. by Hampshire, W. by Somersetshire, and S.W. by Dorsetshire. Area, 859,303 acres; pop. (1871) 257,177. The county is almost quadrangular in form, measuring from N. to S. 54 miles, and from E. to W. 37 miles. It is divided into two divisions by the Vale of Pewsey extending E. and W., the northern, a fertile tract rising near the N. boundary in the direction of the Cotswold Hills, and the southern, a varied district broken by downs, some of considerable height, and intersected by fertile and well-watered valleys, especially along the rivers Avon, Willey, and Nadder. Marlborough Downs belong to the northern district; the great Salisbury Plain to the southern. The chief geological strata are cretaceous, forming part of the great central chalk district of England. Ironstone is found abundantly; the yield in 1878 was 79,176 tons. The principal eminences are Inkpen Beacon (1011 feet), the highest point in the chalk formation in England; Alfred's Beacon (800 feet), and Westbury Down (775 feet). The northern chalk district and the northern part of the county belong to the basin of the Thames, the southern chalk district and the Vale of Pewsey to the basin of the Salisbury Avon, and the western side of the county to the basin of the Severn. The plains in the N. and N.E. sloping to the Thames are of extraordinary fertility, and are covered with large dairy-farms. In the S. and S.E. are ranges of downs, thinly populated, but producing abundant pasture for sheep. The gross rental of W. for 1878 was £1,747,430. In the same year there were within W., under corn crops, 218,471 acres; green crops, 101,035 acres; grasses under rotation, 84,102 acres; permanent pasture, 328,736 acres; and the farm-stock was 22,566 horses, 87,395 cattle, 685,980 sheep, and 70,016 pigs. W. contains interesting antiquities, many from the ante-Roman period. Within it are Avebury (q. v.) and Stonehenge (q. v.). See Sir R. C. Hoare's *Ancient Wiltshire*.

Wimm'era, a district of the colony of Victoria, occupying its N.W. portion, and having an area of 25,000 sq. miles. It consists for the most part of wide sandy plains, thinly grassed and badly watered, yet supporting great flocks of sheep, for which water is obtained by digging wells from 80 to 140 feet deep. The plains are intersected by belts of scrub and forest, and there are also patches of land suited for agriculture.

Wincan'ton, a market-town of Somersetshire, England, on the Cale, 18 miles E.S.E. of Glastonbury by rail, has a town-hall (1878) in Queen Anne style, and carries on a trade in corn and cheese. Pop. (1871) 2377.

Win'cey is a mixed textile fabric, consisting of a cotton warp with a worsted weft. Winceys are woven either plain or twilled, and though generally made of grey, drab, or brown colours without any pattern, in fancy winceys checks and stripes are introduced, but the colouring is always sober. The W. manufacture till recently was extensively and successfully prosecuted at Aberdeen and Perth in Scotland, but for the present the current of fashion is adverse to this strong and economical fabric. It is chiefly used for gowns and petticoats, and of late years it has been commonly employed for men's shirts, &c.

Win'chester, a city of Hampshire, England, 66½ miles S.W. of London by rail, stands at the foot and on the slope of a hill that rises westward from the right bank of the Itchen. The ancient High Street, with narrow thoroughfares branching off at right angles, ascends for about three-quarters of a mile towards the Castle Hill, round or on which, and in the level valley by the water-side, most of the older buildings of W. are situated. A blending of five centuries of styles, the Cathedral outwardly presents a plain and sombre aspect, the central tower (138½ feet high) seeming too low for a building 558 feet long by 208 across the Norman transepts. But the interior is unsurpassed—the long-drawn nave (1394–1410), its bossy roof upborne by massive piers; the choir and sanctuary (1320–50), over whose lace-like reredos the eastern window glows with its pristine hues; and the graceful presbytery (*c.* 1202) contrasting with an ornate Lady Chapel (1470–1524). Of Birinus's church (648), and the cathedral dedicated to St. Swithin (q. v.) by Bishop Æthelwold (980), few traces remain except the relics of kings and saints gathered by Fox into six gilded coffers; but to Walkelin's structure (1079–93) belongs Rufus's tomb, removed to the Lady Chapel (1868); and later monuments are the stately chantries of Langton, Wykeham (q. v.), Beaufort, Waynflete, Fox, and Gardiner, the tombs of Izaak Walton and Jane Austen, the Sumner cenotaph, and Wilberforce memorial screen (1875). St. Mary's College, oldest of English Public Schools (q. v.), was founded by William of Wykeham (1387) as a nursery to his Oxford New College. It still retains the founder's general plan—two main quadrangles, gateway and chapel towers (the latter rebuilt 1863), an exquisite chapel, hall, and cloisters 132 feet square, additions being the schoolroom (1687), 'Commoners' (1841), converted (1869) into class and lecture rooms. Under late statutes the present foundation consists of a warden, ten fellows (temporarily sixteen), a headmaster, and 70 scholars; and in June 1879 there were 24 masters and 385 boys, while among former Wykehamists occur the names of Warham, Sir Thomas Browne, Ken, Otway, Young, Collins, Joseph Warton, Bowles, Sidney Smith, Lowe, and Cardwell. The latest History of the College, with its *argot*, its *Dulce Domum*, its two rebellions (1793 and 1818), &c., is Adams' *Wykehamica* (Oxf. 1878). Neither the twelve ancient (survivors of sixty-five) nor the three modern churches can vie in beauty with the Hospital of St. Cross, lying 1 mile to the S. across the water-meadows. Endowed by Bishop de Blois (1132) and augmented by Cardinal Beaufort's Almshouse of Noble Poverty (1444), this ancient charity consists of a master and thirteen black-robed brethren, and still dispenses the 'Wayfarer's Dole' of beer and bread. One side of its quadrangle is occupied by a noble cruciform church (1171–1292; restored 1865), a specimen of pure Transition-Norman but for the splendid Decorated western window. Other striking objects are the ivy-clad ruins of Wolvesey Castle (built in 1138, and demolished by Cromwell in 1645); the deanery; the W. and King's Gates (the latter surmounted by the 13th c. church of St. Swithin); the 15th c. Butter Cross, 43 feet high (restored 1865); the handsome Guild-hall (1873), designed by Sir Gilbert Scott in Geometrical Gothic and containing a museum; the School of Art (1876); a diocesan training college (1863); the new Assize Courts (1874); Wren's unfinished royal palace (1683), now used for infantry barracks; and, on the Castle Hill, the church-like hall of Henry III.'s

palace (restored 1874–76), where Raleigh was tried, and in which the 16th c. 'Round Table' hangs. No important manufactures have replaced the once famous woollen trade of W., which publishes two weekly newspapers, and returns two members to Parliament. Pop. (1871) 14,785. The Celtic *Caer Gwent* ('champaign fortress'), Roman *Venta Belgarum*, and Old English *Wintanceaster*, W. was conquered by Cerdic in 519, and for 300 years continued the capital of Wessex, being raised to a bishopric by Cenwealh (*c.* 639). In 1013 it submitted to Swegen, in 1042 was the coronation place of Eadward the Confessor, as afterwards of many English kings. Under Henry I. it boasted a cathedral, two royal minsters, sixty churches, a palace, two castles, and a mint; but from the civil wars of Stephen's reign its prosperity declined, the blow of a seven days' siege by Cromwell (1645) being succeeded by the terrible pestilence of 1666. Prior to this it had been the scene of the marriage of Henry IV. to Joan of Navarre (1404), and of Mary I. to Philip of Spain (1554). See Milner's *History of W.* (2d ed. 1809), and Mackenzie Walcott's *Memorials of W.* (Lond. 1866).

Win'chester, a town of Virginia, U. S., 71 miles W. of Washington. It has 15 churches, 2 weekly newspapers, 5 tanneries, iron foundries, alkali-works, and a glove manufactory. Pop. (1870) 4477. W. is the key to the Shenandoah Valley, and its possession was frequently contested during the Civil War.

Win'cing Machine', in dyeing and calico-printing, is a reel or winch placed over the vertical partition of a vat, so that cloth may be drawn from one compartment and discharged into the other according as the handle is turned.

Winck'elmann, Johann Joachim, the famous archæologist and writer on the history of art, was born at Stendal, 9th December 1717, studied at Berlin, Halle, and Jena, and was appointed (1748) secretary to Count von Bünau, the Saxon minister, who dwelt at Nöthenwitz, near Dresden. His position gave him access to the art treasures of that capital, and here he first found opportunity of gratifying his nobler tastes and sentiments. Archinto, the Papal nuncio at Dresden, became acquainted with W. and offered to procure him an office in Rome. There was one condition annexed—W. must become a Catholic. His journey there was, however, deferred for a year. In the interval he published *Gedanken über die Nachahmungen der Griechischen Werke in der Malerei und Bildbauerkunst* (1754, translation, Glasgow 1766), and two other works on the same subject. In 1755, having received a royal pension, he proceeded to Italy, where he was received with favour. Rome answered all his expectations—like Thorwaldsen, he used to date his life from the day he entered it. How he studied the works of art around him we know from the works he has written—works that 'opened the eyes of the Italians themselves.' Of these the chief were *Anmerkungen über die Baukunst der Alten* (Leips. 1762), *Monumenti Antichi Inediti* (2 vols. Rome 1767, German translation 1791–92), and *Geschichte der Kunst des Alterthums* (Dresden 1764, new edition, Berl. 1870; translation by Lodge, Lond. 1850). This, his greatest work, was completed by the publication of *Anmerkungen über die Geschichte der Kunst* (Dresden 1764). W. met his death in a manner that might form a fit subject for the most pathetic of tragedies. After long years of absence he desired to revisit his native land. He began his northward journey, but he found it was 'to drag at each remove a lengthening chain.' He was no sooner beyond Italy than he passionately desired to return. At Vienna he was received with kindness and presents, but he proceeded no further. As he was hurrying back to Rome some signs of wealth attracted the attention of a miscreant named Francesco Arcangeli, by whom he was murdered in an inn at Trieste on the morning of 8th June 1768. W.'s great service to his own and to all future time is that he taught men to look at the art-works of the ancients in a direct, simple, purely objective and therefore true manner. This he did by pointing out wherein the excellence of classic art consists—viz., its 'ideality' and 'placid grandeur.' It strives to represent as far as possible a perfect conception of beauty, marred by no peculiarities or side developments. See Goethe's *W. und sein Jahrhundert* (1805), the complete edition of W.'s works by Fernow, Meyer, and Schulze (Dresden 1808–25; new ed. 1838), and the very full Biography by Justi (2 vols. Leip. 1866–72; Eng. trans. Lond. 1879).

Win'dage is the difference between the bore of a gun and the diameter of the projectile, varying from ·15 to ·9 of an inch for spherical projectiles. For rifled guns the W. is much smaller.

Win'dage (from cannon-balls), or **Wind Contusions**. It sometimes happens, in the practice of military surgeons, that cases of severe internal injury occur in warfare in which there are no external appearances of severe wounds or injury. Thus, there may be rupture of the liver, concussion of the brain, or even comminuted fracture of a bone, the neighbouring tissues bearing no marks in proportion to the severity of the internal lesions; so that it was long conjectured that solid objects projected through the air with great velocity might produce such injuries, indirectly, by aërial percussion, the hurt being inflicted either directly by the force with which the air was driven against the part, or, indirectly, by the rush of air to refill the vacuum created by the rapid passage of the ball. This hypothesis, however, is now generally rejected, the true explanation being that the body is really struck by the projectile in an oblique direction, the comparative escape of the soft tissues being accounted for by the peculiar direction, the degree of obliquity with which the missile impinges on the elastic skin, together with the situation of the structures injured beneath the surface, relatively to the weight and momentum of the ball on one side, and hard resisting substances on the other. See article 'Gun-shot Wounds' in Holmes' *System of Surgery*.

Win'dau, a seaport of Russia, province of Kurland, at the mouth of the river W. in the Baltic, on a deep harbour inaccessible to large ships through a sandbar. W. has a Lutheran church, a Russian church, a Catholic chapel, and a synagogue. Its exports in 1877, chiefly timber, linseed, corn, tar, and pitch, amounted to £178,199, its imports to £12,145. In the same year 387 vessels entered the harbour. Pop. (1875) 4108.

Win'dermere, the largest of the English lakes, being 10 miles long by 1 mile broad, belongs to Westmoreland, though mostly enclosed by Lancashire. With clustering islets, richly-wooded or 'holly-sprinkled' slopes, and bold or gentle headlands breaking the banks into countless bays, W. has more the character of a broad and placid river than of a mountain-locked lake like Wastwater or Ullswater. Only to the N. the Langdale Pikes, Bowfell, and Scawfell form a majestic background. Steamers ply constantly between Ambleside at the northern head, Bowness, and Newby Bridge at the foot of the lake, whose yachts are among the fastest sailers built. With a depth of 240 feet, W. is but rarely frozen over, but in the winter of 1878–79 skating went on over its entire surface.

Wind'ham, William, an English statesman, was born in London, 3d May 1750, of an old Norfolk family, his father being the owner of Felbrigg Hall in that county. He was educated at Eton, at Glasgow University, and at University College, Oxford, which he entered in 1761. After travelling on the Continent, and starting for the North Pole in 1773, he was so seasick that he had to be put ashore again in Norway. Returning to England, he first attracted attention by a speech at Norwich, early in 1778, in opposition to the American War and the ministerial policy in general. At the general election of 1780 he contested Norwich unsuccessfully, but was returned at the general election of 1784. He had meanwhile lived principally in London, become intimate with Burke, Fox, and Johnson, who had the greatest admiration and respect for him, and had also visited Ireland as secretary to the lord-lieutenant, Lord Northington, a post which he resigned after a few months, perhaps on account of conscientious scruples. In Parliament he acted with the Opposition up to the outbreak of the French Revolution, making himself known by his 'insinuating' oratory, as Canning described it, and distinguishing himself as one of the managers of the impeachment of Warren Hastings in 1787. On the outbreak of the Revolution, he followed Burke in deserting the Whig cause and going over to the Government. He of course strenuously supported the war, and in 1794 became Secretary at War in Pitt's cabinet, with which he went out of office in 1801. Under the Grenville administration (1806) he again held office as Colonial Secretary, and brought in and carried, in spite of vehement opposition, a bill for army reform. Its effect was to limit the term for military service, making the infantry enlistment valid for seven years, the cavalry and artillery for ten years; the former renewable of a second term of seven years,

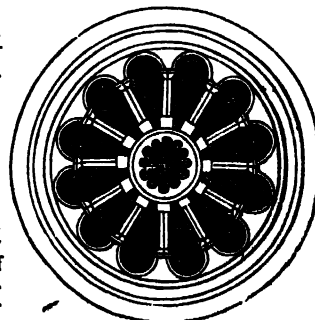
the latter for second and third terms of six and five years respectively. There were also numerous provisions for increased pay and pensions both to officers and men. W. declined the offer of a peerage, and went out of office in 1807. He afterwards strongly opposed the Copenhagen and Walcheren expeditions, but did not again take any very prominent part in politics. He died in London, 3d June 1810. His contemporaries unanimously describe him as the model, both physically and mentally, of an English gentleman—able and high-minded, though so much given to paradox as to earn for himself the nickname of 'the Weathercock.' His conversation was brilliant, his literary acquirements wide, and his power as a debater very great. See his *Speeches*, edited, with a Life, by his secretary, Mr. Amyot (Lond. 1812), and his *Diary from* 1784 *to* 1810, edited by Mrs. Baring (Lond. 1866).

Wind Instruments, musical instruments the sounds of which are produced by the action of the breath of a player or of a pair of bellows on a column of air. The organ is really a collection of W. I. of different kinds, forming a species of orchestra. Ordinary W. I. are constructed of wood, such as the flute, piccolo, clarionet, basset horn, oboe, and bassoon; or of metal, such as the horn, trumpet, serpent, cornet-a-piston, ophicleide, saxhorn, and bombardon. Those of wood have a soft tone, those of brass a loud and powerful tone. W. I. were used sparingly in the early days of the orchestra, but with great liberality in Handel's time, when for every three stringed instruments two W. I. were used. The proportion at present is greatly less. By additional finger keys, &c., W. I. have been greatly improved in the last half-century. Sax of Brussels is one of the best makers. The bagpipe is a wind instrument of a very primitive type, with a leather case as a wind-chest attached to three pipes.

Wind'lass, a mechanical contrivance used on board ship for raising anchors and other heavy masses. The principle of its action is the same as that of the capstan, from which it differs mainly in the horizontality of its axis. It consists essentially of a large roller, supported in *checks* or *W.-bitts*, and rotated by handspikes fitting into mortices in the W., or by means of a single handle with or without additional wheelwork. To prevent the W. from slipping back under the severe pull of the chain, a strong ratchet-wheel is fixed on the roller, and into its teeth a number of *pawls* pivoted in an upright post called the *pawl-bitt* fall as the W. rotates, so as to sustain the stress as the spikes are being shifted for a new purchase.

Wind'mill, a mill of any kind the motive power of which is derived from the impulse of the wind upon a series of revolving sails. Beckmann (*History of Inventions*) is of opinion that windmills were invented in Europe, and not in the East as some authors affirm; and he rejects as unfounded a statement made by Pomponius Sabinus, who flourished in the 15th c., that the Romans used such machines. Germany was probably the country, and the 11th c. the period of their origin. It is certain that windmills were erected in Europe during the First Crusade. In the 12th c. they had become so common that Pope Celestine III. decreed that watermills and windmills were tithable. There are two kinds of windmills—*vertical* and *horizontal*. The vertical, which is the form chiefly in use, consists of a lofty tower, having at the summit a *wind-shaft* or *axle* mounted in bearings. The outer end of the axle is raised about 18° from the horizon, and has attached perpendicularly to it four or five radial arms, about 30 or 40 feet long. Each arm carries a kind of lattice-work, which is covered with canvas to receive the action of the wind. The *sails* thus formed are set at an angle to the axle, so that the wind blowing directly in the face of the mill causes them to revolve in a direction transversely to its own plane of motion. The movement thereby acquired by the axle is transferred by bevel wheels to a vertical *main shaft*, which gears with machinery for performing the specific work of the mill. With a moderate wind the extremities of the sails are estimated to travel at the rate of from 20 to 30 miles an hour. Various reefing arrangements for adjusting the extent of canvas to the force of the wind are adopted. An ingenious automatic device for attaining a pretty steady velocity with wind of varying pressure has been introduced recently, and consists in forming the sails of a framework filled with louvre-boards, which open or close according as the wind blows strongly or lightly. As the direction of the wind is very variable, some means become necessary for bringing the mill to face the wind. The old German method of accomplishing this was to pivot the whole structure on a central post. The Dutch method, which is in very general use, consists in making the W. cap only movable by resting it on rollers, so that it can be turned by a long hand-lever. Sir William Cubitt invented a novel and effective plan of causing the wind itself to adjust the W. cap to its proper position. A set of small sails acting as a vane are mounted opposite the large sails, on an axle transverse to the wind-shaft. So long as the W. faces the wind, the vane remains motionless, but a change in the direction of the wind immediately moves the vane, and its axle actuates gearing which turns the W. cap. A horizontal W. is so named because its sails revolve in a horizontal plane. It is very seldom employed, as its effective power is only one-third or one-fourth that of a vertical W. The principal uses of windmills are in grinding corn, in driving sugar-mills and wood-sawing machinery, in raising water from wells, and in draining land either by working pumps or turning a water-wheel. Steam-power is, on account of its steadiness and certainty of action, to a great extent superseding the W., but in countries where level stretches of land occur, and water is not available, it is still extensively used. In the United States, Corcoran's patent W., which adjusts itself to all variations of the wind either of direction or force, is an important article of manufacture. It is largely exported to the W. Indies, S. America, and New Zealand.

Win'dow, an aperture in the wall of a building for the admission of light and air. Modern domestic windows are usually rectangular openings occupied by movable frames filled with glass. The glazed portion or *sash* is hung or hinged in a *frame*, the horizontal stone forming the top of the window is the *lintel*, that at the bottom the *sill*, the sides of the opening are the *jambs*, and the portion between the outer face of the wall and the frame is the *reveal*. Architraves and other mouldings commonly appear on the exterior. *Venetian windows* are large openings divided by piers or columns into three lights, sometimes arched. Windows projecting in a polygonal or semicircular form from the wall are termed *bay* or *oriel* windows: they were first introduced in the Perpendicular style. The architecture of the Egyptians and Greeks was practically windowless, light and air having been admitted by openings in the roofs. Small openings in the walls of Roman houses were not uncommon. They were at first closed by shutters or covered with a kind of lattice or trellis work; and afterwards a transparent stone, called *lapis specularis*, the modern mica, brought from Spain and Cappadocia, was employed. Excavations at Pompeii have shown that glass windows were also used in the early days of the empire. The traceried W. peculiar to Gothic architecture was developed from the most simple forms. In Old English and Early Norman buildings the windows are small and arched; the interior, and sometimes the exterior, being widely splayed. Some Norman windows have two lights set in a shallow recess and surmounted by a single arched dripstone, and mouldings are frequently introduced. Early English windows are for the most part long and narrow, with acutely-pointed heads. They occur singly, or in groups of two, three, five, or seven lights under an acute arch. Piercing the tympanum space above the lights with a trefoil, or other geometrical figure, was the first step towards the development of the elegant and elaborate Tracery (q. v.) which, with beautifully moulded Mullions (q. v.), became universal in the Decorated style. Windows of the Perpendicular style are marked by a departure from graceful flowing tracery and the introduction of vertical members. Horizontal bars or *transoms* are likewise freely introduced, and flat instead of arched heads are gradually adopted, until the W. becomes divided into a series of plain


Fan or Rose Window.

rectangular lights. Circular or rose windows with dividing shafts or mullions radiating from the centre are met with in Late Norman architecture, and many examples—for instance, in Lincoln Cathedral—remain to show the magnificence attained in their construction during the Early English and Decorated periods. See Sir G. G. Scott's *Lectures on Mediæval Architecture* (Lond. 1879).

Winds are currents of air which, produced by a disturbance of equilibrium in the atmosphere, tend by their motions to restore that equilibrium. Since the air is a gas acted on by gravity, it is evident that equilibrium must exist if the density throughout a level stratum is constant, and if the density diminishes with the height; and any cause which destroys these conditions must of necessity be followed by a mass motion of the air which is perceptible as a wind. The great source of all disturbances of equilibrium is the sun, whose heating action, by expanding a given region of air and so diminishing its density, causes an up-draught with a consequent overflow of air in the higher regions, and an in-draught of denser air from the surrounding regions. Although the first natural effect of heat upon a substance is to raise its temperature, yet, in the case of gases not confined in closed spaces, the observed effect consists more in an increase of volume with corresponding decrease of density. This expansion of air occurs mainly at the earth's surface, where the sun's radiant energy is rapidly absorbed and transformed in great part into heat, which acts upon the contiguous mass of air in the manner already described. Convection at once sets in, and the ascending mass of heated expanding air acting with like effect upon the air immediately above it causes an overflow of air at a higher region of the superincumbent column, thereby diminishing the barometric pressure at the locality where the action was started, and making conditions favourable for the generation of W. The Barometer (q. v.), indicating as it does the atmospheric pressure at any place and time, is invaluable in the study of the laws of W. A single barometer is, however, of small value, except for indicating the variation of pressure *in time* at a given place; for real scientific work its indications must be compared with the simultaneous indications of other barometers at surrounding regions. Thus only can the variations of pressure *in space*, which are the immediate cause of all mass-motions of air, be obtained. As already pointed out, the wind is the great restorer of the equilibrium, in virtue of the loss of which the existence of wind is possible. Hence it may be at once inferred that the wind always blows from a region of higher to a region of lower pressure; and thus a knowledge of the distribution of pressure over a given district of the earth's surface is sufficient to give a general idea of the direction and intensity of the W. at various points. This distribution of pressure is best shown by *isobaric* lines, or lines of equal pressure, each of which is drawn through all places at which the pressure has the value corresponding to that particular line. A series of such lines, each differing in value from its nearest neighbours by a certain definite amount, say 1-10th of an inch of barometric pressure, presents much the same appearance as the contour lines on the chart of a hilly country; and as, in the latter case, the closeness of the lines indicates the steepness of the slope, so in the meteorological chart the closeness indicates the barometric gradient, and where the barometric gradient is greatest there is the wind the most intense. The intensity of the wind is, of course, directly measured at any given station by means of the *Anemometer* (q. v.).

Though the solar heat is thus the original source of all wind action, that which mainly impresses upon particular W. their great characteristics is the earth's diurnal rotation. Thus in passing from the equator to the poles there is, generally speaking, a gradual diminution in the temperature of the air, and a corresponding increase in its density. Hence there must be a general drift of air along the surface of the earth from both poles towards the equator, with a simultaneous drift of air in the contrary direction in the upper regions of the atmosphere. But, because of the earth's rotation, a mass of air moving with a velocity equal to the velocity of the portion of the earth's surface with which it was originally in contact, will, as it drifts to lower latitudes where the velocity due to rotation is greater because the distance from the axis of rotation is greater, lag behind the earth in its motion from W. to E.—that is, the cold air which drifts towards the equator from each pole will appear to have an *easterly* set, while the upper current of equatorial air passing from lower to higher latitudes, and therefore from regions of greater to regions of smaller velocity, will, so to speak, shoot ahead of the earth, and therefore have a *westerly* set impressed upon it. This general atmospheric circulation is of course greatly modified by the configuration of land and water; but in the regions of the so-called *trade-W.* its character is well exemplified. These trade-W. are met with on both sides of the equator, but only at sea, the presence of land completely neutralising their action. Having, as already noticed, an easterly set—N.E. in the northern hemisphere, and S.E. in the southern—they are most characteristic in the western parts of the oceans where they abound. Beyond 30° lat. N. or S., the trade-W. cease, and variable W. prevail; while between the northern and southern regions of trade-W. occurs the region of calms, characterised by thick foggy air with frequent rains of short duration, attended with thunder and lightning. That such a region should exist may be inferred from the fact that for several degrees on each side of the equator the velocity of rotation varies but slightly with latitude, so that the eastern set of the indrawn air is correspondingly small. Meanwhile, co-existent with these constant trade-W. are the reversed upper currents, known as the *anti-trades*—setting towards the N.E. in the northern hemisphere, and towards the S.E. in the southern hemisphere—descending probably to the earth's surface in higher latitudes, and causing the S.-western and N.-western winds which prevail in the warmer regions of the N. temperate and S. temperate zones respectively. Coming originally from a tropical clime, these anti-trades descend to earth moisture-laden. Direct evidence for the existence of these reversed currents is not lacking. Thus when clouds do appear in the generally clear sky of the trade-wind region, they are observed to have a motion opposed to that of the trade-W.; while on the Peak of Teneriffe a strong S.W. wind is invariably experienced, though at its base the N.E. trade-W. reign supreme. The higher limit of the trade-W. varies considerably with the seasons. Thus, in the northern hemisphere, the northern boundary of the Atlantic trade-W. varies from 25° in winter to 32° in summer. In the vicinity of land, the trade-W. are much modified because of the local actions produced by the more rapid heating of land than water during the day, and its quicker cooling during night. Consequently, amid the coral islands of the Pacific, the trade-W. lose much of their characteristic traits. The so-called sea-breeze and land-breeze, which may be frequently observed in calm clear weather at a station near a sea-coast, give a fair notion of the nature of the modifications so produced. During day, when the land air is warmer than the sea air, a sea-breeze sets in towards the land. At sunset this breeze gradually dies down as the land cools, ceasing altogether when the land cools to the same temperature as the sea. After sunset, however, as the land continues to cool, a land breeze sets in, attaining a maximum and then gradually dying away as approaching morn reverses the conditions once more.

Consider now an area of low pressure situated anywhere on the earth's surface—a depression, or barometric trough, so to speak. The air flows in from all sides; but, in so flowing in, the currents from the equatorial side are deflected by reason of the earth's rotation towards the eastern margin of the depression, and the currents from the polar side towards the western margin, so that the result is a whirling or vortex motion of air round an axis passing more or less centrally through the depression. Such is the common characteristic of all storms, hurricanes, or cyclones, which are simply vortex-columns rotating in a direction contrary to the hands of a watch in the northern hemisphere, and in the same direction as the hands of a watch in the southern hemisphere. The deepest depressions originate in tropical regions, usually just within the outer limit of the trades, and the resulting storms recede from the equator with a marked westerly set, until, approaching the E. coast of obstructing continents, they are reflected towards the E., always of course receding at the same time from the equator. As the storm progresses, the vortex column usually dilates, with a corresponding decrease in its fury, though under particular circumstances contraction of the column may take place, with an accompanying increase of violence. In the N. Atlantic, the warm Gulf Stream very probably has a sustaining effect upon the cyclones which cause such havoc along the western coasts of Europe. The storms of the N. Atlantic have been the most fully studied of all, and they have been shown to travel from the equator in an approximately

parabolic path with the vertex towards America. During the last several years warnings have been telegraphed to this country regarding the approach of storms across this ocean, with a generally successful result, although not unfrequently a storm which has left America gets dissipated before it reaches our coasts. As a cyclone passes centrally over a region the barometer is extremely unsteady, falling to a minimum when in the heart of the depression, where, however, there is little or no wind. As the region is left behind it becomes exposed to all the fury of the wind, which now blows in a direction contrary to its original direction. At stations nearer the margin of the huge vortex a similar veering of the wind is observable. The size of these vortex columns varies considerably, from the grand mid-ocean cyclones of it may be 1000 miles in diameter to the small whirlwinds or waterspouts whose whole may be taken in at a glance. A knowledge of the laws of storms is invaluable to the navigator, who is thus better prepared to guide his vessel so as to avoid getting deeper into the hurricane; and for our present knowledge we are mainly indebted to the late Professor Dove of Berlin, who by marshalling fact and theory has firmly established the still barely formed science of meteorology upon its fundamental principles. An exceedingly ingenious theoretical conclusion first developed by Dove is his so-called Law of Rotation, which accounts for the recognised tendency of W. in the northern hemisphere to veer round from N. through E. to S. and on to W., while in the southern hemisphere the direction is altered. When the wind *backs*, *i.e.*, changes its direction in a manner contrary to this law, a depression or atmospheric disturbance of some kind is probably approaching. Instead of a depression, however, there may be an area of high pressure, a barometric crest as it were, which then forms the centre of an anti-cyclone or vortex column, whose direction of rotation is contrary to that of ordinary cyclones. Such an area of high pressure over Scandinavia was the immediate cause of the long-continued snow and frost which made so exceptional the winter of 1878-79 in western Europe. Anti-cyclones, however, have little of the fury of the cyclone, and no such evident translatory motion which characterises the latter. It has been impossible to touch upon more than the main features of wind action; for more detailed account the reader is referred to standard meteorological works, such as Sir John Herschel's *Treatise on Meteorology*, Buchan's *Meteorology*, or to Kaemtz's excellent manual. In Dove's original papers in *Poggendorff*, and Quetelet's memoirs in the *Annales de l'Observatoire de Bruxelles*, much suggestive matter is to be found. In conclusion, the statistical labours of Dr. Meldrum, the director of Mauritius observatory, into the periodicity of cyclones in the Indian Ocean, apparently coincident with the sun spot periodicity (see SUN), merit notice.

Wind'sor, the principal royal residence of England, and a municipal borough of Berkshire, is beautifully situated on the brow of a chalk hill overlooking the Thames, 23 miles W.S.W. of London by the Great Western Railway. It is properly called New W. to distinguish it from the decayed village of Old W., distant some 2 miles. The town has a handsome town-hall, 3 Dissenting chapels, 2 libraries, 2 hospitals, a dispensary, a grammar and other schools, infantry barracks, and a theatre. The Albert Institution, which is to comprise a great public bath, library, museum, &c., was founded 28th February 1879. It returns 2 members to Parliament, and publishes 2 newspapers. An iron bridge connects W. with Eton, the pinnacles of whose famous college are visible across the Thames. The great castle of W. stands on a steep chalk bluff to the E. of the town, and its buildings, covering 12 acres of ground, are girt on three sides by a terrace, which has a length of 2500 feet. It stands in the 'Little Park,' which is 4 miles in circumference, and is connected with the 'Great Park' (18 miles in circuit) by a grand avenue of trees. The Great Park lies S. of the castle, and further W. is W. Forest, with a circuit of 56 miles. The Norman keep, the royal house, and the chapel of St. George, crown Castle Hill, from which depending gardens and terraced slopes stretch away to a wide, wooded level, where rich corn land and pasture alternate with trim parks, open heaths, and forest glades. The district abounds in historical associations; the dripping wells bear the names of queen and saint, and the hoary oaks are entwined with legends. Shakespeare and Chaucer have a part in W. as well as Edward and Victoria, and almost as tangible as any historical fact are the mystery of Herne the Hunter, and the amours of the Merry Wives. By 'the winding shore' (from which is derived the name *W.*), stood a hunting-lodge as early as the time of Edward the Confessor. A legend which has not yet disappeared from the locality, ascribes the creation of this lodge to the semi-mythical King Arthur. The common story, however, is that William the Conqueror built the castle. But modern research shows not the slightest evidence of this, although William certainly inhabited the castle. There is no masonry of the 12th c. at W., and the earthworks, it is believed, were made in the time of Julius Cæsar or Caractacus. Removing his dwelling from the river's margin to the crest of the hill, Henry Beauclerc erected the First King's House, a pile which extended from the Devil's Tower to the Watch Tower, re-named Victoria Tower. Parts of Beauclerc's edifice remain in the massive walls of the Devil's Tower, &c. The Second King's House, the work of Henry of Winchester, brought within its lines Winchester Tower, and the whole curtain by Curfew and Salisbury Towers, round to Lieutenant's lodgings, now called Henry III.'s Tower. Although the house itself has long since disappeared, much of Henry's work remains, while to his successor, Edward of W., the upper ward owes its final shape. The lower ward Edward renounced entirely to the service of St. George, and here were built the Chapel of St. George, the College of St. George and the Canons and Poor Knights of St. George. Edward of York rebuilt St. George's Chapel on a larger scale, while Henry of Richmond, besides roofing the chapel, built a 'new tower' in the King's House, and constructed the first causeway to London. Queen Elizabeth erected the gallery which bears her name, and raised the great solid terraces above the Thames. The Norman Keep was raised in height by George IV., who also flanked the park entrance with Brunswick Tower, opened St. George's gate, and buttressed the north-east tower. Queen Victoria has attended rather to the slopes and gardens than to the castle; but during her reign the southern terrace has been opened, the work of restoration and repair has been effected diligently and reverently in cloister and chapel, and two railways have been brought to the castle gates. Since the days of Edward of W. the Castle Hill has kept its triple character, comprising the upper, middle, and lower wards, the bailies of the king, of the keep, and of St. George—'the residence of our sovereign, the symbol of our power, the altar of our saint.' Frogmore, the favourite residence of Queen Charlotte, and later of the Duchess of Kent, is half a mile from W. See Tighe's *Annals of W.*; Menzies, *History of W. Forests and Parks*; the *Transactions of the Archæological Society for* 1866 (paper on the Society's work in *Saturday Review*, 11th August 1866); and Hepworth Dixon's *Royal W.* (2 vols. Lond. 1879).

Wine (Lat. *vinum*; Fr. *vin*; Ital. *vino*; Ger. *wein*), a spirituous liquor produced by fermentation from vegetable substances containing saccharine matter. There are a great many vegetable substances from which, by this process, W. may be produced, such as apples, pears, currants, elder berries, and others; but unless otherwise expressed, the term is always used to indicate the fermented juice of the fruit of the common Vine (q. v.).

The history of the vine and its product goes back to the very earliest times of which there is any record, and it may almost be said that its use is coeval with the existence of man. In a very early part of the Mosaic record it is said, 'Noah began to be a husbandman, and he planted a vineyard, and he drank of the wine, and was drunken' (Gen. ix. 20); and throughout the whole of the Old Testament narrative, and in the prophetical books, there are frequent references to the use of W. and its effects. In mythological times Bacchus or Dionysos, the son of Zeus and Semele, is known as the god of W.; and the early Greek poets have sung its praises. Homer speaks of W. in its eleventh year; Horace commends W. which was of equal age with himself; and Pliny, who devotes to the subject an entire book of his work on Natural History, mentions some which he had tasted which was 200 years old. In more modern times the culture of the vine has been a matter of careful study and anxious observation, and so important has become everything connected with its proper growth and propagation and the most advantageous use of its fruit that the published works on the subject are said to number no fewer than 600.

In W.-producing countries the cultivation of the vine is as much a branch of national industry as that of wheat or other

food-producers is in others. The soils which are found to be suitable for its growth are very various in quality, but it thrives best along the borders of rivers or in places where a constant supply of water can easily reach its roots, as along the Rhine valley or in the paludal districts of the Gironde. It is usually propagated, not by seed, which takes five or six years before a seedling begins to bear, but by means of eyes cut from vines and planted in open beds and vineyards, or by planting cut canes which have been obtained from plants of the previous year, and which are usually not interfered with for three years after being put in the ground. The plants are placed in parallel lines, about a yard apart from each other, while the single vines are removed from each other by about the same interval. When the grapes are ripe they are collected and transformed into W. with no unnecessary delay. White grapes are crushed and pressed, and the juice, freed from stalks and husks, is put into clean barrels and allowed to ferment in a cellar or other temperate place. Black grapes, which are to yield red W., are crushed, put into vats, juice, husks, and all, and allowed to ferment until the W. is completed, and has extracted the colouring matter. The W. is then drawn off, the murk pressed, and the united products put into barrels. The process of fermentation, on which the peculiar property of the extracted liquor depends, proceeds spontaneously after the grapes have been crushed and the liquor extracted, and its action is to convert the sugar contained in the fruit into alcohol and carbonic acid. Effervescent wines, such as champagne, are bottled before the fermentation is quite complete, and in that way a portion of the carbonic acid which would otherwise have escaped is forcibly retained and dissolved in the W. The amount of alcohol contained in the W. varies in different sorts. In the stronger ports and sherries it amounts to from 16 to 25 per cent.; in hock, claret, and other light wines from 7 per cent. The greater part of the wines having more than 13 per cent. of alcohol (*i.e.*, 26 degrees of proof spirit) may be assumed to be brandied or fortified with spirit.

The obscure process of fermentation, by which the sugar of grape juice is changed into alcohol, has been the subject of a vast amount of investigation by many eminent investigators, the last and greatest of whom is Pasteur, who has published a most valuable work, *Etudes sur le Vin* (2d ed. Par. 1873). The change is induced by a minute fungoid organism, *Mycoderma vini*, and chemically it consists in transforming 105·4 parts of grape sugar (glucose) into alcohol 51·1 parts, carbonic acid 49·4, succinic acid 0·7, glycerine 3·2, and yeast matter 1·0. With these there are also developed minute portions of fusel oil and ether, to which is due the aroma or bouquet of the W. These ethers develop and interact while the W. is maturing, and as the value of a W. is entirely due to its richness in respect of these, the maturing and proper preservation of W. is a matter of the utmost importance. Other changes also occur during ripening. The acid tartrate of potash contained in the juice separates and forms a crust of Argol (q. v.); and frequently, especially with light wines, acid fermentation ensues, and the W. becomes sour. The acid fermentation is caused by a fungus, *Mycoderma aceti*, or by oxidation of alcohol by exposure. Other diseases of W. are due to parasitic and other growths, which have been traced by M. Pasteur. The varieties of W. produced are almost endless, and differ in every constituent according to the locality, season, and age; but generally the produce of each vineyard retains its own leading characteristics. In France, which stands pre-eminent as a W.-producing country, vineyards are found in almost every department; but the principal districts or centres round which the different classes of wines are grouped are Bordeaux, Burgundy, Rhône, Champagne, and the S. of France. The Gironde, of which Bordeaux is the centre, supplies the greater proportion of the light red wines we receive, and which are generally known under the name of clarets; and it includes several well-known districts, such as the Medoc, the Graves or Sauterne district, St. Emilion, and others. The Medoc furnishes the best wines of this part of France, and in the southern division are some of the most important vineyards. Among these are the famous names of Chateau Margaux, the property of a Spanish banker, the Marquis Aguado; Chateau Lafitte, the property of the banking-house of the Rothschilds; and Chateau Latour. The white wines of this district are generally known in England as Sauternes, among which is included the Chateau Yquem. The total annual produce of red and white wines in the Bordeaux district is estimated at about 90,000,000 of gallons. The name Burgundy is applied to the produce of the E. central districts of France most favourable to the cultivation of the vine, which also yield red wines of the highest quality. Among the most celebrated of these are Romanée Conti, Chambertin, Clos Vougeot, and La Tâche, all grown in the Côté d'Or, or 'golden hillside,' a low chain of hills extending from Dijon to Mâcon, on the Saone. The Rhône district is principally known in England from its production of Hermitage. Champagne is produced in several departments of France, including the Loire and the Jura, but the more important and valuable qualities are the produce of a district in the department of the Marne, part of the former province of Champagne. The best qualities are obtained only in the prefectures of Rheims and Epernay. The production of Champagne has increased enormously in our time. In 1835 only about 5,000,000 of bottles were exported from France; while in 1866 it had increased to no less than 22,000,000. Of the S. of France wines, that of Rousillon is the best known in this country. Of German wines, the most highly-esteemed are those which are produced on the banks of the Rhine, which have been aptly termed 'the gardens of the vine,' and the other most notable districts are those of the Mayn and the Moselle. The finer descriptions of Rhine and Mayn wines are generally known in England under the term Hock, although Hock, strictly speaking, is the produce of Hochheim, on the Mayn. With the exception of Assmannhausen, a red wine grown at Assmannhausen, a little below Rudesheim, the wines of Germany are nearly all of the white description. The best-known vineyards are those of Johannisberg, Steinberg, Marcobrunn, Rudesheim, Hochheim, and Raventhal. The district in which most of them are situated, known as the Rheingau, has attained a world-wide celebrity for its produce. The Johannisberg, which may be said to be the most famous of all, is a conical hill, projected from the Taunus Mountain, and rising about 150 feet above the level of the Rhine. It varies considerably in inclination, but the upper third, which is protected by the high castle from northerly and easterly winds, produces the best W. The property of this vineyard has frequently changed hands. At the time of the French Revolution it was in the possession of the then Prince of Orange, but it was taken from him after the battle of Jena, and given by Napoleon to Marshal Kellermann. In 1815 the Emperor of Austria took possession of it, and in the following year it was given to Prince Metternich, and still remains in the possession of his family. The preparation of the W. is carried through with the utmost care, and those bottles which are to be sent to a distance are packed with every precaution to ensure their safety. The brand of the Metternich arms is placed on each cork, and a label is placed on the bottle stating the name, year, and price of the W. which it contains. A well-known writer on wines says that 'a fine bottle of mature Johannisberg Castle is, by the fulness of its taste and the mass of its bouquet, the finest and most powerful drink on earth.' The finest vintages of Johannisberger sell for about 35s. per bottle, and secondary qualities are quoted at 24s. By some these wines are regarded as much overestimated. Of the same class generally with the wines of France and Germany are those of Hungary, which produces an excellent W. of a claret kind. Carlowitz is becoming extensively used in England as a light W. Tokay (q. v.) is the most famous of all Hungarian wines; and among vintages found in the British market may be mentioned Œdenburger, Somlauer, Ruster, Erlauer, and Ofener. These wines have from about 11 to 14 per cent. of alcohol, and possess the reputation of being somewhat rough. The produce of the Spanish Peninsula is of a different character from the wines already described, being generally of the descriptions known in this country as ports and sherries, the strongest of all kinds of wines, and at the same time the least natural; although in some districts natural unfortified wines of excellent quality are also produced in abundant quantity. Spain, as a wine-producing country, is generally divided into three sections,—the white W. or sherry district on the south-west coast, including the province of Cadiz; the red W. district in the north and north-east; and the sweet wine district in the south and south-east. In the first of these is situated Xeres, an important vine-growing district of many thousand acres in extent, which yields the best quality of sherry. The sherry and port imported to this country have an additional amount of alcohol, in the shape of grape spirit, put into them after fermentation in order to preserve them, and they are artificially sweetened. This adds considerably to their

strength, and gives it more body and keeping power than is possessed by the lighter natural wines. Malaga W. is a sweet luscious wine of great body, which is produced in the province of that name. The best-known port—the characteristic W. of Portugal—so far as concerns the English market, is Bucellas, which is said to have been made originally from transplanted Rhenish vines. Madeira, the produce of the island of that name, is a W. similar in character to sherry, and like it the various qualities are usually fortified by the addition of grape spirit. It is of great enduring quality, and is much improved by age and keeping. It is the practice to ship it to the E. or W. Indies, in order to bring it to proper maturity. Other varieties of W. are those of Marsala from Sicily, and Greek and Cyprian wines. Of Cape wines little comes to England in a natural condition; most of what is imported being used to produce strong brandied liquids in imitation of sherry and port. The Cape wines have not, however, a high reputation for delicacy or bouquet. Australian and American wines are not equal to those of Europe, and they yet occupy a very unimportant place; but their production is increasing, and they will no doubt improve, as they afford a cheaper and more natural beverage in those countries than wines which have been imported. The following return, made to an order of the House of Commons in April 1879, shows the number of gallons of French, Spanish, Portuguese, and all other foreign and colonial wines imported into the United Kingdom in the years 1859, 1873, 1875, and 1878, with the relative duties per gallon paid in 1859 and in the subsequent periods:—In 1859, of and from France, 1,010,888 gallons; Spain, 3,629,235 gallons; Portugal, 1,797,854 gallons; other foreign countries, 967,690 gallons, at a duty of 5s. 9 3-10d. per gallon; British possessions, 789,756 gallons, at a duty of 2s. 10 13-20d. per gallon—total, 8,195,513 gallons. In 1873, from France, 6,242,856 gallons; Spain, 9,389,367 gallons; Portugal, 4,037,594 gallons; other countries, 2,012,589 gallons—total, 21,682,356 gallons. In 1875, from France, 5,280,914 gallons; Spain, 6,891,738 gallons; Portugal, 4,478,097 gallons; other countries, 1,778,709 gallons—total, 18,429,305 gallons. In 1878, from France, 6,038,596 gallons; Spain, 5,714,948 gallons; Portugal, 2,920,285 gallons; other countries, 1,778,709 gallons—total, 16,452,538 gallons. For the three years last mentioned the following duties were levied:—Containing less than 26 degrees of proof spirit, 1s. per gallon; containing 26 and less than 42 degrees of proof spirit, 2s. 6d. per gallon; and additional for every degree of strength beyond the highest above specified, 3d. per gallon. A very exhaustive treatise *On the Origin, Nature, and Use of W.*, by Drs. Thudichum and Dupré, was published in 1872, and is now the authoritative text-book on wines and their culture.

Wings, the name applied to those organs in animals by which flight is effected. In their most typical development, as seen in birds, they consist of the bones of the fore-limbs, specially modified to form a support and axis, whilst attached to this skeleton are the muscles moving the limb. Externally the skin is provided with feathers, and the whole fore-limbs of the bird thus form the W.; while the bones of the shoulder girdle are modified to form a special support for the organ of flight. In the Bat (q. v.) the 'wing' consists of an expansion of the skin or integument, supported on four of the fingers, which are extremely long. This membrane, or *patagium*, extends from the fore limbs to the hind limbs, and in many cases between the hind limbs and tail as well. In such Mammalia as the flying foxes, flying squirrels, flying phalangers, and in the lizards known as flying dragons, the 'wing' is a mere expansion of skin, extending along the sides of the body, often connecting hind and fore limbs, and serving as a parachute to sustain the animals in their flying leaps from tree to tree, but in no sense serving as an organ of true flight. In insects the wing is formed of two delicate skin layers, supported on hollow tubes or *nervures*, placed in communication with the respiratory or breathing system. The W. of insects become thus related to respiration, and by their movements probably aid in the diffusion of air through the breathing-tubes.

Wink'elried, Arnold Struth von, a Swiss of Unterwalden, who, at Sempach, on the 9th of June 1386, contributed to the victory over Duke Leopold of Austria by rushing on the lances of the enemy and opening up a lane for his countrymen. A monument on the spot commemorates the deed. See Liebenau, *Arnold W.* (Aarau 1862); and Kleissner, *Die Quellen der Sempacher Schlacht und die Winkelriedsage* (Göttingen 1874).

Winneba'go, a lake of Wisconsin, U.S., in the basin of the Fox River. It is 26 miles long and 10 broad, and has an area of 212 sq. miles. Both the river and the lake are navigated by steamboats, and afford good fishing.

Winneba'goes, Winnipegoos', or Little Winn'ipeg, a lake of British N. America, draining into Lake Winnipeg, from which it is distant 50 miles westward. W. measures 125 miles by 25. It abounds in fish, and its shores are very fertile.

Winn'ipeg Lake, a lake in the province of Manitoba, British N. America, in the basin of the Saskatchewan (q. v.). It is 280 miles long from N. to S., and 60 miles in maximum breadth. Its area is 9000 sq. miles, and its altitude 710 feet above sea-level. Its chief tributaries are the Red River (q. v.) from the S., the Winnipeg from the S. E., Jack River and Behrens River from the E. Lakes Winnipigoos and Manitoba drain into it on the W. The Saskatchewan enters it on the N.W. and leaves it at the N.E. The lake is of varying depth, being very shallow towards the S. The E. coast is composed largely of Laurentian rocks; Silurian prevail towards the E. By the opening of a railway, 2000 miles long, towards the close of 1878, W. L. was brought into communication with New York.

Winn'ipeg River rises in Minnesota, U.S., and flows to Lake Winnipeg. Its course, though serpentine, is generally northwards. It passes through Rainy Lake and the Lake of the Woods, which are thus connected with Lake Winnipeg. Though its length is only 520 miles, it drains a very large basin, and discharges an immense volume of water into Lake Winnipeg. W. R. abounds in fish, and its shores are richly wooded, but the forest is rapidly being cleared, for the soil yields magnificent wheat crops. An Icelandic national colony has been founded, and a rapid influx of settlers from Britain is taking place. Much mineral wealth is known to exist in this region, though as yet it is undeveloped.

Winn'ipiseo'gee Lake (from *Winipisaukee*), a lake of New Hampshire, U.S. Its length is 25 miles, its breadth varies from 1 to 10 miles. Area 175 sq. miles; elevation above sea-level, 472 feet. It discharges by the Winnipiseogee River, an affluent of the Merrimac. It is studded with islands, and abounds in fish. The beautiful scenery of this district attracts many tourists.

Wino'na, a township of Minnesota, U.S., on the Mississippi, 90 miles S.E. of St. Paul by rail. It was founded in 1851, and has 15 churches, a public library, a normal school, 1 daily and 3 weekly newspapers. There are 3 saw-mills, 7 flour-mills, 2 foundries, and 6 carriage-factories. In 1874 it exported 5,550,000 bushels of wheat and $1,500,000 of lumber. Pop. (1875) 7192.

Win'slow, Forbes Benignus, D.C.L., born in London, but of a Massachusetts family, August 1810, was educated in Scotland and near Manchester, and after studying medicine at New York and the London University, passed the College of Surgeons (1835), and took his M.D. at Aberdeen. With his earliest practice he combined the duties of a *Times* reporter, but having since 1830 paid special attention to insanity, he opened a private asylum at Hammersmith (later another in London), and rose in time to be the supreme authority on all relating to diseases of the brain. Founder and editor of the *Quarterly Journal of Psychological Medicine and Mental Pathology* (1848) and of the *Medical Critic* (1861), vice-president of the Juridical and president of the Medical Society (1853), President of the Association of Medical Officers of Asylums (1857), and a Commissioner of Lunacy (1859), he was besides a member of numerous scientific bodies, a frequent contributor to the press, and the great 'expert' in medico-legal cases. He died at Brighton, 3d March 1874, having published *The Application of Phrenology to the Elucidation and Cure of Insanity* (1831), *Anatomy of Suicide* (1840), *Plea of Insanity in Criminal Cases* (1843), *Notes on the Lunacy Act* (1845), *Softening of the Brain* (1849), *Lettsonian Lectures on Insanity* (1854), *Obscure Diseases of the Brain and Disorders of the Mind* (1860; 4th ed. 1868), *Light, its Influence on Life and Health* (1867), &c.

Win'terbergen, a lofty mountain-range in the E. of Cape Colony, forming a part of the great dividing chain, sometimes

called 'the backbone of S. Africa.' Its culminating point, the Great Winterberg Peak, is 7806 feet high.

Win'ter Green (*Pyrola*), a genus of about 15 species of biennial or perennial herbs with evergreen leaves belonging to the natural order *Ericaceæ*. The white, pink, or yellowish flowers are generally arranged in one-sided racemes, and the fruit consists of a globose, five-angled capsule. They are distributed through the N. temperate zone, five species being natives of Britain, but all ranking as rare or local plants. None are of any economic interest.

Win'terhoek Mountains, a range in Cape Colony whose eastern termination is about 30 miles N.W. of Port Elizabeth (q. v.). Its loftiest peak, the Cock's-comb, is estimated to be 8000 feet high, and, though 20 miles inland, is visible 60 miles out at sea. There is also a W. Peak, 6840 feet high, 75 miles N.E. of Capetown, whence it is visible.

Win'ter Moth (*Cheimatobia brumata*), a species of Moth (q. v.) or *Lepidopterous* insect, the larvæ of which injure the leaves of plum-trees especially. It has a somewhat local distribution in England, attains a length of half an inch, and is of a light-brown colour. The male alone appears to be winged. The larvæ come out early in spring and devour large quantities of leaves. To protect plum-trees from their ravages the stems are coated with tar and grease.

Win'ter's Bark is the red-brown bark of *Drimys Winteri*, a tree, native of extra-tropical S. America, attaining in river-valleys a height of 60 feet. The name commemorates Captain Winter (one of the companions of Sir Francis Drake), who introduced the bark 300 years ago as an aromatic tonic. It is now seldom used, the W. B. of trade being the produce of *Cinnamodendron corticosum*, and nearly allied to Canella Bark (q. v.). See Tasmania.

Winter'thur, a town in Zürich, Switzerland, on the river Eulach, 38½ miles S.W. of Konstanz by rail, with hand silk-weaving, iron-founding, and manufactures of cottons, machinery, and locomotive engines. Pop. (1870) 9404.

Win'throp, a great American house, whose founder, Adam W., was born at the English town of Lavenham, Suffolk, 9th October 1498, grew rich as a London clothier, and in 1544 received a grant of the manor of Groton in his native county, where, after holding the mastership of the Clothworkers' Company (1551), he died 9th November 1562. His grandson, **John W.**, the 'Father of Massachusetts,' was born at Groton, 12th January 1581, studied at Trinity College, Cambridge (1602–4), and by his marriage (1605) acquired much outward estate and influence with the Puritans of the Eastern Counties. This led to his being chosen governor of the band of 900 colonists who, sailing from Yarmouth with eighteen vessels, landed at Salem 12th June 1630, W. during the voyage writing his *Modell of Christian Charity*. Settling at Shawmut (Boston), he became possessed of Governor's Island, still held by the W. family, and annually, with three exceptions, was re-elected governor down to his death at Boston, 26th March 1649. His fervent but tolerant piety, leader-like capacities, and liberal culture are reflected in his *Journal*, edited by J. Savage as *History of New England*, 1630–40 (2 vols. Bost. 1825–26; 2d ed. 1853), and well earned him the statue reared in the Federal Capitol by the State he founded (1876). See his *Life and Letters* by R. C. Winthrop (2 vols. Bost. 1864–67).—Son of the preceding by the first of four marriages, **John W.** was born at Groton 12th February 1606, and graduating at Trinity College, Dublin (1625), studied law at the Inner Temple. He served on the Rochelle expedition (1627) as attaché of the British embassy, visited Turkey (1628), and joining his father in Massachusetts was chosen a magistrate of the new colony (1633). Returning from a visit to England with a commission to found the new settlement of Saybrook at the mouth of Connecticut River (1633), he there raised a fort and acted as governor, his wife, a daughter of the 'regicide' Hugh Peters, removing from Boston to Pequit Harbour in 1645. On the union of Saybrook to Connecticut (1651) he became a magistrate of the latter colony, and as its governor (from 1651) obtained on a second visit to England (1661) a charter from Charles II. for the further incorporation of New Haven. He died at Boston, 5th April 1676, leaving in the *Transactions* of the Royal Society, of which he was an early member, proofs of his skill in physics and chemistry.—**Fitz-John W., F.R.S.**, born at Ipswich, Massachusetts, 14th March 1638, was bred in England and held a commission under Richard Cromwell (1658), but returned to Connecticut about 1670, and like his father was governor from 1698 till his death at Boston, 27th November 1707.—To the next generation belonged **John W., LL.D., F.R.S.** (1714–79), professor of mathematics and natural philosophy at Harvard from 1738, and author of able astronomical, as his son, **James W.** (1752–1821), was of theological works.—And in the present century come **Theodore W.** (1828–61), who falling at Great Bethel, in the first engagement of the Civil War, left several volumes of novels and essays, *Cecil Dreeme* (1861; 17th ed. 1864), &c.; and **Robert Charles W.**, sixth in descent from Governor John. Born at Boston, 12th May 1809, he graduated at Harvard (1828), studied law under Daniel Webster (1828–31), and was a Whig member of the Massachusetts legislature (1836–40), and of Congress (1841–50), filling in both assemblies the post of speaker. A United States senator (1850–51), he has paid two visits to Europe, has long been president of the Massachusett's Historical Society, and has spent many years at Brookline, near Boston, in lettered retirement, being author of *Addresses and Speeches on various occasions* (3 vols. 1853–78), a Memoir of Appleton (1861), *Washington, Bowdoin, and Franklin* (1876), &c. See W. H. Whitmore's *Notes on the W. Family and its English Connections* (Albany 1864).

Wire-Drawing is an art probably first practised in connection with the preparation of the fine strips or ribbons of gold and silver used in the manufacture of the rich gold and silver inwoven tissues which were largely made in Eastern countries. These strips, in ancient times, were cut from thin beaten plates; but in the early Christian ages the art of preparing drawn wires was first practised. The capacity of any metal for being formed into a drawn wire depends upon its ductility, and that property is greatest in gold, after which among the more familiar metals come silver, platinum, iron, copper, zinc, tin, and lead. The metals which are in practice employed are silver (with gold-plated silver for 'gold' wire), iron including steel, and copper with some of its alloys, especially brass. The manufacture of wire from these various sources, and its industrial applications, have enormously increased in recent years. The processes employed in the case of all metallic wires and the apparatus used are essentially identical, but the strength of the mechanism and the power applied necessarily vary with the gauge of the metal operated on. Taking iron wire as an example, the first process consists in preparing small circular rods of fine fibrous charcoal iron by passing it through suitable rolling-mills. These rods form the raw material of iron W.-D. The essential feature in all forms of W.-D. apparatus consists of the draw-plate, a plate of fine hard steel pierced with a regular gradation of punched holes of the various decreasing sizes, the gauge of which the wire is drawn. Through these holes of decreasing diameter the rod or wire is successively drawn, and when sufficiently reduced to form into a coil, it is wound on a revolving cone, the revolutions of which draw the wire through the holes in the fixed draw-plate. When dealing with rods or bars of considerable thickness in their first stages, they are drawn straight through the plate without attempting to coil or wind them up. In the process of reducing the wire to smaller gauges, the metal must be frequently annealed, and to protect it from the film of oxide which would thereby form on its surface, it is dipped into a scour bath of weak sulphuric acid and sulphate of copper, whereby it gets a thin protective coating of copper on its surface. For very fine wire, draw-plates jewelled with rubies or other precious stones are employed. Dr. Wollaston succeeded in obtaining wires of platinum and gold of $\frac{1}{30000}$ in diameter by coating bars with silver, drawing the composite bars exceedingly fine and dissolving off the silver; and in the same way steel wires of great tenuity have been prepared.

Wir'eker, Nigel, flourished in the 12th c. in the reign of Henry II. He was a precentor in the Benedictine Monastery at Canterbury, and a friend of William of Longchamp, afterwards Bishop of Ely, to whom he dedicated a treatise *On the Corruptions of the Church*. His chief work is *Brunellus*, or the *Speculum Stultorum* ('Mirror of Fools'), a satirical poem extending to nearly 4000 verses of Latin elegiacs. The hero Brunellus is an Ass who, convinced that he has an immense power of

patient labour, resolves to study at the University of Paris; he goes through the sciences, tries the various orders of the Church, is dissatisfied, resolves to establish a new one of his own, and after a long discussion with his favourite 'Galen,' is caught by his old master and forced to resume his original and true occupation. The poem is brisk and biting in its ridicule of scholastic and monastic follies, and may be regarded as in part a protest against ecclesiastical abuses.

Wire Ropes of iron or steel wire are now extensively employed in raising and lowering apparatus in coal-mines, as standing rigging for ships, as substitutes for chains in suspension bridges, and for telegraph cables. Endless W. R. are also used on traction railways, and in transmitting power over long distances where ordinary belting would prove unsuitable. Birmingham is the chief seat of the manufacture. W. R. were used in 1822 for a suspension-bridge at Geneva, and for a similar structure of great span at Freiburg in 1835. The earliest forms of W. R., known as *selvagee*, *formed rope*, and *flat rope*, have been almost wholly supplanted by the form known as *laid rope*, which is composed of strands of hard wires, usually six, laid spirally without twist around a core of hemp or wire, six of these strands being placed without additional twist around a hempen core. A variety of machines are in use for making W. R. The relative values of round ropes of iron, steel, and hemp are here tabulated :—

Hemp.		Iron.		Steel.		Breaking Strain.
Circumference.	Weight per Fath.	Circumference.	Weight per Fath.	Circumference	Weight per Fath.	
ins.	lbs.	ins.	lbs.	ins.	lbs.	tons.
5½	7	2⅛	4	1⅞	2⅝	8
7	12	2⅝	7	2⅛	4½	14
8	16	3⅛	9	2⅝	5½	18
9½	22	3⅝	13	3⅛	8	26
12	34	4⅛	20	3⅝	12	40

Wire Worm, a term applied to the larvæ or caterpillars of *Coleoptera* (q.v.), or Beetles belonging to the family *Elateridæ*. They are highly destructive to the roots of cereals, grasses, potatoes, and other plants. They moult thrice, and some are known to pass three years in their larval condition. From their long, slender, and cylindrical form, they get the name 'W. W.' The body is flattened at either extremity, and they have six legs and one anal proleg. Other names of the W. W. are 'Skip Beetle,' 'Click Beetle,' and 'Spring Beetle,' from its habit of jumping and springing when placed on its back, an effect due to the peculiar conformation of its chest-segments. The typical genus *Elater* has the front of the head of convex shape, and the chest is narrow at its anterior portion. The nearly-allied genus *Agriotes* also includes species of beetles, the W. W. larvæ of which are highly injurious to crops.

Wis'beach ('beach of the Wash'), a river-port of Cambridgeshire, England, stands on the Nene, 7 miles above its entrance into the Wash, and enjoys communication with the Midland, Great Northern, and Great Eastern Railways. Its church of SS. Peter and Paul, a large Early English and Perpendicular structure, has a double nave and a fine detached tower, the work most probably of Archbishop Morton; and there are also a town-hall (rebuilt and enlarged 1873), a spacious cattle-market (1869), a corn exchange, handsome Board schools (1879) in Early Pointed style, and a tabernacle cross by Sir G. G. Scott in memory of Thomas Clarkson (1877). Large sums have already been expended in improving the navigation and the construction of wharves, and since 1876 plans have been prepared for the formation of a floating-dock and altering the channel of the Nene, at a cost of £192,000. In 1878 there entered 448 vessels of 57,884 tons, and cleared 352 of 39,490 tons, while in 1877 the imports (chiefly timber and cereals) amounted to £352,808, the exports to £52,519. Brewing, tanning, iron-founding, and the manufacture of tobacco-pipes are among the industries of W., which publishes two newspapers. Pop. (1871) 9362. W. Castle, first mentioned in 1236, rebuilt by Morton, and now demolished, was the prison of Robert Bruce's wife, of Bishops Wishart and Watson, and of Catesby, Tresham, and other recusants. See the Proceedings of the British Archæological Society for August 1878, and Miller & Skertchley's *Fenland, Past and Present* (Wisb. 1878).

Wis'by, the chief town of the Swedish island of Gotland, is a thriving seaport on the W. coast, and has a fine cathedral (1200), and a pop. of (1875) 6314. It was once one of the richest of the Hanse towns, with 18 churches, but was taken and destroyed by the Danish king Valdemar III. in 1361, and has never regained its importance. There are great ruins of seven of its former churches; but of the others and of the castle of *Wisborg*, destroyed by the Danes in 1675, there is little trace left.

Wiscon'sin, one of the United States of North America, N. of Illinois and S. and W. of the Lake and State of Michigan. Area, 53,924 sq. miles, or 34,511,360 acres; pop. (1875) 1,236,729. Its surface is unbroken by any large mountains, but the tributaries of the Mississippi are separated from the affluents of Lake Superior by the low range of Iron Hills in the N.W., and from those of Lake Michigan by another watershed of small elevation. Nowhere do these hills exceed 1800 feet in height. The Wisconsin and Chippewa, tributaries of the Mississippi, are the chief rivers. The former is connected by a canal with the Menomonee, an affluent of Green Bay, Lake Michigan. Of many beautiful lakes the finest is Winnebago (q. v.). The geological formations include the Laurentian and Huronian in the N. centre, and various sandstones and limestones in the S.E. and W. The surface to the W. is covered by forest, and in the S. by extensive prairies. Wolves, bears, and deer are still found, but the buffalo, antelope, and wild turkey are extinct. The mean annual temperature of W. is about 42° F.; its summer is short and hot, its winter severe. The total amount of land under cultivation in 1870 was 11,715,321 acres, valued at $300,414,064. Its produce was valued at $78,027,032. This had probably increased to over $100,000,000 in 1875, in which year 24,784,000 bushels Indian corn, 18,436,000 wheat, 20,069,000 oats, 5,956,000 potatoes, 1,164,500 tons hay were raised. The live-stock were then valued at $54,733,803, and included 348,700 horses, 900,700 neat cattle (464,800 milch cows), 1,211,300 sheep, and 587,000 swine. The railway mileage in 1875 was 4875 but this is being rapidly extended. In the course of 1878, 83¾ miles were opened for traffic. The nationality of emigrants to this State is very varied. Germans, Welsh, Irish, and French abound. The principal towns of W. are Madison the capital, Milwaukee, La Cross, and Racine. W. was first settled in 1839, and was admitted to the Union in 1848.

Wiscon'sin River rises in Lake Vieux Desert, on the borders of Michigan and Wisconsin, U.S., and flows S. through deep pine-forests to Portage City, Wisconsin, where it becomes navigable, and from whence a short canal leads to the Fox River, then flows S.W. for 200 miles, joining the Mississippi 4 miles below Prairie du Chien. The breadth of the W. at its mouth is 1800 feet, its elevation is 600 feet, and its total length over 600 miles.

Wiscon'sin, University of, at Madison (q. v.), in Wisconsin, U.S., incorporated in 1838, opened its first classes in 1851. It comprises a school of ancient and modern classics; a school of agriculture, engineering, mining, and of general and military science; and a school of law (organised in 1868). Instruction is free to all natives of the state (of both sexes since 1867). In 1875-76 the U. of W. had 27 teachers and 345 students. The revenue, mainly drawn from land granted by Congress in 1838 (46,080 acres), in 1854 (46,080 acres more), and in 1866 (240,000 acres more), and augmented both by State appropriations in 1870 and 1875 to the amount of $170,000, and by an annual tax (levied since 1876) on the total valuation of the State, is now about $40,000.

Wise, Henry Alexander, an American statesman, was born at Drummondtown, Virginia, December 3, 1806, graduated at Washington College, Pennsylvania, in 1825, sat in the Baltimore Convention of 1832, where he advocated the nomination of General Jackson for President, but opposed that of Van Buren for vice-president, opposed nullification, was elected to Congress in 1833, and re-elected successively each year until 1843, when he was nominated minister to France by Tyler (q. v.), whose election as vice-president he had promoted. The Senate refused to confirm his appointment, but allowed him to be sent as minister to Brazil in 1844. In 1847 he returned to his native country, and took part in the Presidential election of 1848. In 1850 he was a member of the Reform Convention of Virginia, and in 1855 was

elected Governor of Virginia after an arduous canvass against the 'Know-Nothing' party. In this capacity he signed the death-warrant of John Brown (q. v.) in 1859. Though opposed to secession, in 1860 W. followed his State, and during the Civil War held the commission of a brigadier-general. Since the war he lived a private life at Richmond, where he died, September 12th, 1876.

Wise'man, Nicholas Patrick Stephen, Cardinal, was born of Anglo-Irish parentage at Seville, Spain, 3d August 1802. Brought by his mother to England at the age of five, he first was placed at a school in Waterford, and next at Ushaw, whence after close upon eight years' study he passed to the English College at Rome (1818). Here he found a fast friend and patron in Leo XII., graduated D.D. (1823), received priest's orders (1825), and two years later was made Professor of Oriental Languages in the Roman University, becoming also vice-rector, and in 1828 rector, of the English College. As such he extended in 1832 a generous welcome to Lamennais and Montalembert, no favourites of Gregory XVI., and delivered his lecture on the *Connection between Science and Revealed Religion* in 1835, the year of his return to England. His founding with O'Connell the *Dublin Review* and controversy on the Real Presence with the Bishop of Ely were followed by his appointment to the presidency of Oscott and consecration at Rome as Coadjutor of the Midland District (1840), on which occasion he induced the Pope to augment the number of English Vicars-Apostolic. His hopes for the conversion of England, fostered by the spread of Tractarianism, by an Act of Parliament authorising diplomatic relations with Rome, and by his interview with Lord John Russell, led him to urge on Pius IX. the re-establishment of the Catholic hierarchy during two visits to Rome, in 1847–50, between which visits he rose to be pro-vicar and vicar-apostolic of the London District. But returning in 1850 as Archbishop of Westminster and the first cardinal in England since Pole's death, he found himself met by Russell's *Durham Letter*, a cry of 'Papal Aggression,' and the Ecclesiastical Titles Bill (q. v.). Stillborn as was this Act itself, it influenced W.'s later years, which, save on the rare occasions when he still lectured at the Royal Institution, were wholly passed in the diligent discharge of his episcopal functions, and in company where his princely rank remained unchallenged. He died in London 15th February 1865. His works, somewhat too ornate for an English taste, are widely read upon the Continent; they include *Horæ Syriacæ* (1828), *The Real Presence* (1836), *Lectures on the Doctrines and Practices of the Catholic Church* (2 vols. 1836), *Three Lectures on the Catholic Hierarchy* (1850), *Essays on Various Subjects* (3 vols. 1853), *Fabiola, or the Church of the Catacombs* (1855), and *Recollections of the Last Four Popes* (1858), some of which in their German form had reached by 1878 a 4th, a 6th, even 11th edition. A graceful tribute is paid to the Cardinal's learning, virtues, justice, and sweetness of disposition in Lord Houghton's *Monographs* (Lond. 1873).

Wish'art, George, one of the earliest martyrs for the Protestant faith in Scotland, belonged to a good family in Kincardineshire, and was born early in the 16th c. He was educated at the University of Aberdeen, whence he proceeded to France and Germany, where he probably imbibed the doctrines of the Reformation. On his return to Scotland, he commenced the study of Greek at Montrose—the first town in his native country where that language was publicly taught. Becoming a teacher of the new tongue, he was summoned before the Bishop of Brechin on a charge of heresy, for having put into the hands of his scholars the Greek New Testament, and in consequence withdrew for safety to England in 1538. Here he entered himself at Bennet, or Corpus Christi College, Cambridge, where he lived for six years. In 1543 he went back to Scotland, and soon attracted great audiences by the eloquence of his preaching and the exalted piety of his character. At Montrose, Dundee, Ayr, Galston, Mauchline, and other places, he boldly and fervidly proclaimed the gospel message, exciting the enthusiasm of his friends and the rage of the priests. In December 1545 he arrived in Leith, in answer to a request from his Ayrshire friends to meet them in Edinburgh and defend himself before a convocation of the clergy. Here he preached, having among his auditors Knox and many of the Lothian gentry. Thence he proceeded to Inveresk, Tranent, and Haddington, haunted with the conviction that his end was near. Arrested in the house of Cockburn of Ormiston by the Earl of Bothwell, he was brought to St. Andrews, where he was tried by a clerical assembly, and condemned to death as an obstinate heretic. On the 1st of March 1546 he suffered at the stake on Castle Green. Within three months his proud persecutor, Cardinal Beatoun, was assassinated. There is evidence that this violent deed was planned some time before the death of W., and that a certain 'Wysshart' was privy to the design, and had an audience with Henry VIII. on the matter. So much is clear from the Hertford and Sadleir 'State Papers.' The Scotch gentry by whom this 'Wysshart' was deputed were the martyr's friends; and it is difficult, except on *à priori* grounds (which are, of course, unsatisfactory), to resist the conclusion that the gentle and mystic enthusiast was no more averse to the 'killing of the cardinal' than Knox himself would have been. See Foxe's *Book of Martyrs*, Knox's *History of the Reformation*, M'Crie's *Life of Knox*, Burton's *History of Scotland*, and Cunningham's *Church History of Scotland*.

Wis'mar, a seaport of Mecklenburg-Schwerin, Germany, situated at the S.E. end of a bay which forms a safe and commodious harbour, 18 miles N. of Schwerin by rail. It contains several fine edifices, especially the Gothic Marienkirche (1339), the Nicolaikirche, the Heiligegeistkirche, the Fürstenhof (1554), now the seat of the municipal authorities, the Rathhaus, and the theatre (1842). W. has fisheries, iron-founding, and manufactures of chicory, tobacco, beer, brandy, and essences. In 1871 there entered its harbour 264 vessels, and cleared 260 of 16,265 tons. The chief article of export was wheat to England, and the chief imports were—from England, coal, iron, fire-proof stone, cement, and earthenware; from Sweden, timber and iron; from Lübeck, general wares; and from Prussia, timber, tiles, cheese, &c. Pop. (1875) 14,471.

Wiss'embourg (Ger. *Kron-Weissenburg*), a town of Lower Elsass, on the Lauter, 41 miles N.N.E. of Strassburg by rail, has a Gothic abbey church of SS. Peter and Paul (13th c.), with a tower and cloisters, an evangelical church, and a gymnasium. It manufactures hosiery, paper, hats, and leather, and carries on brewing, dyeing, and considerable trade in wine. Pop. (1875) with the garrison (two battalions of infantry) 6152 (3613 Evangelicals). W. owes its existence to an independent Benedictine abbey, which was founded in the 7th c. and secularised in 1534. The town, dating from 1247, was one of the ten free-towns of the Empire in Elsass. It suffered severely during the Thirty Years' War, was in 1677 sacked by the French, and in 1697 annexed to France. It was fortified by the French in 1746. At W., on August 4, 1870, the Prussians and Bavarians under the Crown Prince gained their first great victory over the French under Douay. The Germans lost in the action 91 officers and 1460 men [illegible] and wounded; and took 4 mitrailleuses, 22 guns, and 10[illegible]oners.

Wista'ria, a genus of *Leguminosæ*, [illegible]s of N. America, China, and Japan. The leaves are pinnate, the flowers are arranged in axillary and terminal racemes, and are succeeded by leathery pods. In the two species in common cultivation, namely, *W. frutescens* and *W. chinensis*, the lilac-coloured flowers are produced in a profusion of pendulous bunches. The first is indigenous in the United States, and the other of Eastern Asia. Both are frequently grown against sunny walls, and can be trained to extend over a large area, when they are strikingly ornamental.

Witch'craft is often defined as a survival of paganism, but the definition, if not indeed erroneous, is certainly incomplete, as it fails to account for the W. of non-Christian races. Take, for example, the widespread superstition that one can hurt an enemy by moulding an image of him in wax and melting it before a fire, or piercing it with pins; the charm belongs as little to any heathen as it does to the Christian faith. It was an act of sorcery pure and simple alike when practised by the Italian peasant of Virgil's day (*Ecl.* viii.), or by the ladies forming the Nizam of the Deccan's harem early in this the 19th c., and when Margery Jourdain, the cunning witch of Eye, employed it against the life of Henry VI. Again, if W. be merely paganism lurking in disguise, how is it that we find the very pagans persecuting its votaries to the death—the Roman decemvirs making it a capital offence, and at Athens a witch named Lemia executed in the lifetime of Demosthenes? The difficulty vanishes before the theory of one of the latest and ablest investigators of

the subject, Mr. A. C. Lyall. He maintains that 'from the very outset there has been a radical separation between W. and the humblest form of religion, that W. is the aboriginal and inveterate antagonist of religion or theology, and hardly less so in the most primeval ages of barbarous superstition than it was in the days of King James I.' The underlying principle of all religions, even of Fetishism (q. v.), is that man by himself can do nothing, but W. is grounded on the belief that certain men possess certain abnormal powers, which they can exercise without the intervention of a deity. It was the world-old story of knowledge making men as gods. The earliest savage Prometheus who stole fire from heaven—in other words, discovered that by the friction of two sticks he could produce a flame—would be apt thenceforth to omit to pray for fire; and his untutored mind, ignorant of the true relation of cause and effect, might leap to the conclusion that he who was able thus to command the fire should also be able to call down rain. Children in the western counties of England still fancy that if they see a rainbow in the sky and set two sticks crosswise, the colours will presently fade away; and so indeed they do. Similar experiments have doubtless proved no less satisfactory to many a primeval meteorologist, who to himself and his neighbours would seem, like the wife in the German *mährchen*, a kind of ruler of the universe. Medicine, too, opened up a boundless field for mingled knowledge and credulity. If now-a-days the inventor of a patent pill, which possibly is good for a single ailment, dares vaunt its efficacy in every known disorder, assuredly the first chance discoverer of simples to cure an ulcer or a toothache would be tempted enormously to magnify his simples' and his own abilities, and admiring patients would ask themselves whether he who could heal could not also inflict disease. The latter notion would be sedulously fostered by priests, whose mediatory trade was spoilt by another's pretensions to independent power, and who, while claiming the credit of every blessing for their gods, would cast the blame of all untoward accidents on such a worker of unlicensed miracles. At first the outward difference between a sorcerer and the priest of a barbarous creed would seem as slight as between Messrs. Maskelyne and the Davenport Brothers. Each would perform the selfsame tricks as his rival, but the priest would ascribe them to the deity working through him, the sorcerer to his own occult arts. And these would bring him no small profit, since everywhere and at all times man, when heaven denies its help, has been ready to have recourse to inferior aid—a truth brought out in the Virgilian line, '*Flectere si nequeo superos Acheronta movebo*,' and in the history of Saul, who, having inquired of the Lord and received no answer, sought counsel from the witch of Endor. A principle, moreover, of fetishism and polytheism being Live and let live, he would be safe from persecution on abstract religious grounds, though jealousy, fear, and resentment might expose him to instant peril of his life. 'The magician,' says Lecky, 'was punished because he injured man, and not because he offended God;' and to support this opinion he adduces the stringent edicts passed at Rome against casting the horoscope of the reigning emperor as a practice tending to promote conspiracies, though at the time divination formed part of the Roman religion. But measures against a reputed sorcerer might receive a religious tincture by priests being called upon to aid in his detection through Ordeals (q. v.), which everywhere present a strange identity, those of water and heat being equally familiar to the modern Indian witch-finder and to the mediæval inquisitor. Another curious point of resemblance between the Eastern and Western systems of W. is that suspicion generally fell or falls on women, and 'such women commonly,' adds Reginald Scot, 'which be old, lame, bleare-eyed, pale, foul, and full of wrinkles.' A reason commonly given for this preference, that conception of Catholic celibacy which drew from the Fathers such fierce invectives on the female sex, fails in the case of non-Christian lands; dislike of ugliness was, therefore, the most probable cause. Such is an outline of early W.; which presently assumed a quasi-religious character, since the wizard, to keep abreast of the priest, would find it necessary himself 'to claim a backstairs interest with deities,' so would patronise some ill-conditioned god, only making him serve as a familiar instead of paying him service. Thus the original antipathy between religion and W. subsisted, but in a somewhat modified form; and the memory of the real origin of W. (a smattering of science) was preserved in many of the names of W. and its practitioners —Eng. *wise man* or *woman* and *wizard*;* Russ. *vyêd'ma*, 'witch,' from *vyedat*, 'to know;' Gael. *fiosachd*, 'sorcery,' from *fios*, 'knowledge,' &c.; just as the awe felt for all science by the vulgar expressed itself in the Lat. *mathematicus* ('astrologer') and the Fr. *grimoire* ('a grammar or book of magic,' whence *gramary*), and in the ascription of Magic (q. v.) to the reputed inventors of gunpowder, printing, and the like.

Alone of all the ancient faiths Judaism had from the first sternly discountenanced W., the Law including in one sweeping condemnation all workers of hidden arts—diviners, augurers, fabricators of charms, and necromancers. As monarchies are always more jealous of their rights than republics, so monotheism could not but look on the claiming of godlike powers by men as an infringement of the One God's attributes, as a 'sin of rebellion,' to be punished as such; and this feeling increased in intensity and was extended in its application with the growth and spread of Christianity, whereby mankind was split into two hostile camps. For as the number of malcontents increases if once a rallying-point be granted them in the person of some arch-rebel or dethroned sovereign, so witches multiplied, or were believed to multiply, thanks to the Christian concept of a Devil (q. v.). The whole heathen world was assigned him for a realm, the ancient divinities were branded as cacodæmons, and to the early Christian the earth seemed so replete with evil spirits (afterwards estimated at 7,405,926 in number) that the Messalians of the 4th c. A.D. even made spitting a religious exercise, hoping thereby to cast out the devils they inhaled. The belief, moreover, that each human soul is an individual entity, to be saved or lost, led to the grosser notion that man, by a kind of *post-obit* compact, might purchase power and satisfaction in the present world at the price of eternal torment in the next; and so early as the 6th c. one hears of Theophilus, coadjutor-bishop of Adana in Cilicia, signing away his soul to Satan, but cheating his creditor with the Virgin's help. Eutychianus' Greek version of this legend found its way into western Europe, where the nun Hroswitha cast it into a Latin drama in the 10th c., as in the 13th Rutebeuf did into a French miracle-play; and the type thus struck, and further embellished with a species of feudal homage to the Fiend, became a pattern for innumerable later tales, one of which even attached itself to the name of a Roman pontiff, Sylvester II. Another widespread superstition was that demons, both male and female (*incubi* and *succubi*), made mortals the objects of their passion; 'this fact it were impudent to deny,' said St. Augustine, who himself saw a satyr. The fears inspired by such doctrines may easily be conceived, and when the Church obtained political ascendancy, her earliest efforts included measures against W., paganism being still too strong to be safely assailed. Soon after his conversion (306), Constantine the Great condemned to the flames any aruspex who should perform his rites in a citizen's house; and the persecution, which with occasional breaks lasted for upwards of seventy years, had a powerful influence on the subsequent history of W., by forming a mass of tradition that placed the reality of the crime beyond a doubt. In 385 Priscillian, a Spanish bishop, was executed at Trier for sorcery; towards the close of the 6th c. great numbers of women were burnt or broken upon the wheel for slaying Fredegunde's son by spells; and many wizards suffered under new edicts of Karl the Great. But for six hundred years witch-trials were comparatively rare, lay superstition proving its own antidote in days when fear of demons was equalled by unquestioning faith in relics and holy water, whilst the clergy as masters of the position found few heresiarchs to brand with sorcery. First the heretical movements of the 13th c. disturbed the Church's calm; next the Black Death (q. v.), attended by the Flagellant and dancing manias, aroused the popular mind to a dread conviction of Satan's agency. Small wonder that some poor rebel souls transferred, as they deemed, their fealty to this all-powerful master, and shared for reward the fiery death of scores upon scores of innocent victims to the universal panic. At Carcassonne in Languedoc alone over 200 persons were condemned during 1320-50, and from this period the prominence of 'Witches' Sabbaths' dates. Not that belief in such unholy gatherings was new, since Psellus,

* *Witch* (O. Eng. *wicce*) has itself been often derived from the Old Eng. *witan* (Ger. *wissen*, 'to know'), but is more probably akin to the Gothic *veihan* (Ger. *weihen*), 'to do or consecrate,' in which case it may be compared with the Ger. *zauberer* (O. H. Ger. *zouwan*, 'to make'), the Ital. *fattucchiero*, 'a sorcerer' (Lat. *facere*), &c.

in the 11th c., had described how 'certain magical heretics, to wit the Eutychians, assemble themselves every Good Friday at night, . . . and cutting their children in pieces, fill pots with their blood, then burn the carcases, and mingle the ashes therewith, and so preserve the same for magical rites' (Scot). But floating traditions concerning the secret conventicles of persisting or relapsed pagans and heretics were now first gathered together; now first we read of witches riding through the air on broomsticks or by the virtue of magic salves, of their feastings, dances, and songs, their sacrifices of dogs, cats, and unchristened babes to a goat-shaped fiend, and of many other unhallowed rites, all stereotyped in the *Malleus Maleficarum* (1489) of the German inquisitors, Krämer and Sprenger. These worthies' appointment was due to the Bull *Summis Desiderantes* of Innocent VIII. (1484), and under them commenced that German reign of terror which cost 7000 lives at Trier, 600 at Bamberg, and 900 at Würzburg—atrocities rivalled by 1000 executions in the Italian province of Como within a twelvemonth, 400 at Toulouse in a day, 500 at Geneva in three months' time, &c. The madness seized upon all nations and all estates of men, alike on Catholics and Protestants, and often on the accused as firmly as on their accusers, so that 'for the most part,' says Lecky, 'the trials represent pure and unmingled delusions.' As Mohammed had ascribed his rheumatism to the magical practices of enemies, so Luther looked on his earache as 'peculiarly diabolical,' and exclaimed of witches, 'I would burn them all.' England by its insular position and intense political life was longest preserved from the infection; and Jean Darc, noblest of all the delusion's victims, died on French soil and under a French bishop's sentence, although by English hands. But slumbering superstitions awoke in the tumult of the Reformation, and we find Cranmer's articles of visitation bidding the clergy make inquisition for 'any that use charms, sorcery, enchantments, W., soothsaying, or any like craft invented by the Devil.' The earliest formal statute was passed in 1541, and this and succeeding laws long remained milder than those of Continental states, witches accused of murder being sentenced to the gallows, not the stake, and their less guilty sisters to the pillory and imprisonment only, while pricking, swimming, and deprivation of sleep were gentle tortures compared with those prescribed by Bodin in his *Demonomanie des Sorciers* (1587). James VI., himself the author of a dialogue on *Dæmonologie* (1597), carried to England the sterner Scottish 'Actis anentis W.,' and in the first year of his reign a parliament, including Coke and Bacon, doomed witches to death on a first conviction, even though they should have abstained from injury to their neighbours. His cruelties, however, against the Lancashire witches were wholly eclipsed during the Commonwealth, in whose brief term of power over 3000 sorcerers are said to have perished, and chiefly in the Presbyterian Eastern Counties. At Bury-St.-Edmund's sixty were hanged together in 1646, 'among them an old reading parson, who confessed that he had two imps,' as Baxter with evident complacency remarks in his *World of Spirits*. There also, twenty years later, sentence was passed upon two Lowestoft witches by the benevolent Sir Matthew Hale, who upheld the existence of W. as well by the Scriptures as by the laws of England and other lands; while the author of *Vulgar Errors*, Sir Thomas Browne, complained how 'the Devil in these cases did excite such humours superabounding in men's bodies, whereby he did afflict them with distempers, co-operating with the malice of those we call witches.' And from Suffolk the gloomy delusion passed to the New England settlements, Governor Winthrop (q.v.), whose eldest son himself dabbled in alchemy, presiding at the conviction of Margaret Jones, of Charlestown, in 1648. She was the first of more than forty victims, the last and most famous of whom were the twenty Salem witches (1692), nineteen of whom were hanged, while one, an old man of eighty, was pressed to death. In this 'New England tragedy,' the most notable points were the action of Cotton Mather (q. v.), by Lowell and most authors accused of having with other Puritan divines blown superstition's dying embers into a flame, but defended by Mr. Poole, and the fact that all the accused died protesting their innocence with unshaken constancy. In Scotland there can be hardly any question that, under the influence of Presbyterian fanaticism, W. assumed the vastest proportions and most malignant character. Elsewhere the superstition was largely mixed with imposture; here it was wholly undiluted. Its outbreak followed close upon the Reformation, the earliest law being passed in 1563; and throughout its entire course a spiritual terrorism was fostered, upheld, and protracted by the Scottish clergy, the divines of the Associated Presbytery declaring as late as 1773 their belief in W., and deploring the reigning scepticism. Boxes were set in the churches to receive the accusations, and from their pulpits the ministers denounced suspected persons by name, forbidding anyone to shelter them. In all, 4000 victims are thought to have perished, among them 30 women who were charged with having raised a tremendous storm to sink the ship that was bringing James VI. and his bride from Denmark (1590). The last judicial execution for W. in Scotland took place at Dornoch in 1722, in England at Huntingdon in 1716, in Germany at Landshut in 1756, in Spain in 1780, and in Switzerland at Glarus in 1782. And from the cessation of executions most writers infer that belief in W. has utterly passed away—an inference hardly borne out by facts. Leaving aside such out-of-the-way regions as the Ukraine, where, according to Ralston, each hamlet still keeps its witch, we will confine ourselves to England, and single out a few of the witch cases of the last twenty years. In 1865 a poor old paralysed Frenchman died in consequence of having been swum as a wizard at Castle Hedingham, Essex; in 1875 the trial at Warwick Assizes of the murderer of a reputed witch brought out the fact that over one-third of the villagers of Long Compton were firm believers in W.; and in April 1879, at E. Dereham, Norfolk, a man was fined for assaulting the daughter of an old woman who had charmed him by means of a 'walking toad.' At the present time the writer knows of at least four 'wise men' in Wales, who thrive on the fees they receive from their dupes, and the infamous nature of whose dealings strongly corroborates Mr. Lyall's verdict that, 'if we may judge by study of its practices from real life in India, our ancestors may have had very good reasons for persecuting W., though they proceeded on grounds widely mistaken, and very often against the wrong persons.' W., however, save in the guise of Spiritualism (q. v.), has ceased to form an article in the creed of all educated people, excepting a few such eccentric spirits as the late Vicar of Morwenstow, R. S. Hawker (died 1875). That Wesley was right in saying that 'giving it up is in effect to give up the Bible,' few would allow; had he for 'Bible' substituted 'Devil,' he had shown a clearer perception of the true causes of one of the greatest revolutions in human thought—a revolution wrought, not by the fresh exposure of a delusion sufficiently exposed by Wier and Scot, but by the steady, imperceptible spread of 'Scepticism.' See Johann Wier, *De Præstigiis Dæmonum* (Basel, 1563); Reginald Scot, *The Discouerie of W.* (Lond. 1584; 2d ed. 1651); Glanvil, *Sadducismus Triumphatus, or Full and Plain Evidence concerning Witches and Apparitions* (Lond. 1689); Sir G. Mackenzie, *A History of the Witches of Renfrewshire* (1678; new ed. Paisley, 1878); Haas, *Die Hexenprocesse* (Tüb. 1865); W. F. Poole, *Cotton Mather and Salem W.* in the *North American Review* for January 1869; A. C. Lyall, *W. and Non-Christian Religions* in the *Fortnightly* for April 1873; besides works cited under MAGIC, VAMPIRE, WERWOLF, and in Buckle's *History of Civilisation in England* (new ed. Lond. 1867), Lecky's *History of Rationalism* (5th ed. Lond. 1872), Lowell's *Among my Books* (Lond. 1870), Tylor's *Primitive Culture* (Lond. 1871), and M. D. Conway's *Demonology and Devil Lore* (2 vols. Lond. 1879).

Witch' Hazel (*Hamamelis virginica*), a shrub of 6–12 feet high, native of woods from Canada to Florida, bearing axillary clusters of yellow flowers, which are produced during a great part of the winter. Its seeds contain a quantity of oil and are edible, while the bark and leaves are astringent. The W. H. has been long in cultivation as a garden ornament. The natural order *Hamamelidaceæ*, or the W. H. family, includes 17 genera of deciduous shrubs with alternate leaves and small axillary flowers, found in N. America, Africa, and Asia, but not represented in the European flora. The name W. H. is said to be derived from the supposed virtue of the above-mentioned species as a divining-rod.

Wit'enagemot'. See PARLIAMENT.

With'er, George, an English poet, the only son of George Wither, a landed gentleman, was born at Brentworth, near Alton, in Hampshire, June 11, 1588. From the grammar-school of Coleman W. passed in 1604 to Magdalen College, Oxford, and

after spending some little time at home 'at the plough,' he went to London and entered himself fellow of Lincoln's Inn. A satire, *Abuses Stript and Whipt*, which he published in 1613, led to his imprisonment in the Marshalsea; but his *Satire to the King*, supported, it would appear, by the friendship of the Earl of Pembroke, secured his release in the following year, and in 1622-23 he obtained the king's patent for his *Hymns and Songs of the Church*. In 1632 we find him in the Netherlands, and in 1639 he served as captain of horse in the expedition of Charles I. into Scotland. Three years later he raised a troop of horse for the Parliament; and though he was taken prisoner by the royalists, they were, if not generous enough, at least facile enough to set him free on Sir John Denham's plea that while W. lived Denham was not the worst poet in England. From the Parliament he afterwards received numerous favours, culminating in the mastership of the state office in 1655 and 1656; but on the Restoration his property was confiscated, and he was once more cast into prison. Released in July 1663, he only survived till May 2d, 1667. W. is one of the most voluminous of poets; upwards of a hundred separate publications are enumerated by his bibliographer. The greater part has little permanent worth, though he almost always wrote good simple honest English; but ever and anon we come upon poems or passages that are the very perfection of artless art. Damned by Pope as the 'wretched W.,' he has in more modern times received the praise of Brydges, Hallam, Southey, and Lamb. Among his more important productions are *The Shepheard's Hunting* (1615), a pastoral; *Britain's Remembrancer* (1627), *A Collection of Emblemes* (1635), and *Hallelujah, or Britain's Second Remembrancer* (1643). See Willmott, *Lives of the Sacred Poets*; and Farr, Introduction to his edition of the *Hallelujah* (Lond. 1857).

Wit'ness. See EVIDENCE, LEGAL. CIRCUMSTANTIAL EVIDENCE. One credible W. is sufficient legally to prove any single fact. A W. may not read his evidence, but he may refer to memoranda made by himself at the time when the fact to which he testifies took place. A W. on whom a Subpœna (q. v.) has been served, failing to appear at the trial, forfeits £100 to the Queen and £10 to the aggrieved party, besides being liable in damage to the value of any loss caused by his absence. But a W. in a civil case is not bound to attend a trial unless his expenses are tendered to him. Daily allowances to witnesses range from 5s. to subordinate mechanics or out-of-door labourers, to £1, 1s. to professional men, who are paid according to time employed. Men of business who are not so paid, and non-professional gentlemen, are only allowed a reasonable sum for necessary expense.

Wit'ney, a market-town of Oxfordshire, England, on the Windrush, 13¾ miles W.N.W. of Oxford by rail, has an interesting 13th-c. church (restored 1867), a staple or blanket hall (1721), town-hall (1863), and county court-house (1859); publishes one weekly newspaper; and besides its celebrated manufacture of blankets, has brewing, glove-making, and other industries. Pop. (1871) 2976.

Witt. See DE WITT.

Witt'ekind, or **Wid'ukind**, the leader of the Saxons in their struggle with Karl the Great, came of a noble Westphalian house, and first appears at the head of the Saxon expedition against the Westphalian fortress of Eresburg (774). The emperor's return from conquering the Lombards drove him across the Weser, and after vainly renewing the revolt in 776, he fled to Denmark, but returning during Karl's absence in Spain, laid waste the Rhineland and surprised and annihilated the Frankish army on the Süntelgebirge (782). Karl retaliated by executing 4500 Saxon prisoners, an action that roused the entire Saxon race to arms. The battle of Detmold was drawn (783), but that of Osnabrück crushed W.'s hopes and forced him to enter upon negotiations, whose issue was that in 785 he accepted baptism in the imperial camp at Attigny, in Champagne. Karl, it is said, made him Duke of the Saxons and lord of Engern, and from his castle of Babilonie, near Lübeck, he exercised a mild and righteous sway till 807, when he fell in battle with Gerold, the Swabian duke. Various princely houses, as those of Brunswick and Sardinia, claim W. for the founder of their line. See Diekamp, *Widukind der Sachsenführer* (Münst. 1877).

Witt'enberg (the 'wood fortress'), a town of Prussia, province of Sachsen, on the right bank of the Elbe, 240 feet above the sea, and 42 miles N.E. of Halle by rail. The Elbe is here crossed by a stone bridge (1847) on eleven pillars and 903 feet long, and by a railway bridge of twelve arches and 964 feet long. There are three suburbs, all built since 1817. The Schloss, till 1542 the residence of the Saxon Electors, formed afterwards the citadel of W., which till 1873, when its fortifications were demolished, was a third-rate fortress. In the Schlosskirche (1490-99, and twice rebuilt after 1760, and in 1818), on whose doors Luther nailed his ninety-five theses (31st October 1517), are the tombs of Friedrich the Wise, Johann the Steadfast, Luther, and Melanchthon, as also portraits of the last two by Lucas Cranach, who was burgomaster of W. The doors were in 1858 replaced by bronze gates, on which the text of the theses is inscribed. The Stadtkirche has a famous altarpiece by Cranach, several of whose pictures decorate the Rathhaus. In the market-place is the colossal bronze statue of Luther by Schadow (1822), and near it is the statue of Melanchthon by Drake (1866). An oak-tree outside the Elsterthor marks the spot where Luther burned the papal bull of excommunication, 10th December 1520. The University of W. (founded in 1502), where Luther was professor of theology, was united to that of Halle, 12th April 1817. Its building is converted into a barrack. The theological college of W. occupies the 'Lutherhaus,' the Augustinian monastery where Luther was a monk. W. manufactures mats, linens, and woollens, and carries on brewing, distilling, and fishing. Pop. (1875) with the garrison (three battalions of infantry and artillery) 12,427. W., first mentioned in 1180, became under Albrecht I. the residence of the Dukes of Sachsen, and continued to be that of the Sachsen-W. line till the battle of Mühlberg in 1547, shortly after which it passed to the German Emperor. In the Seven Years' War W. was occupied by the Prussians, but was forced to capitulate to the Austrians, October 14, 1760. Seized by the French in 1806, it was taken by Tauenzein, 13th January 1814. See Schadow, W.'s *Denkmäler* (Wittenb. 1825); Meyner, *Geschichte der Stadt W.* (Dessau 1845); K. Schmidt, *W. unter Kurfürst Friedrich dem Weisen* (Erlangen 1877).

Witt'enberge, a town of Prussia, province of Brandenburg, at the confluence of the Stepnitz with the Elbe (here crossed by a railway bridge on 35 pillars, and 1367 yards long), 88 miles N.W. of Berlin by rail. It has a new Evangelical church in Gothic style, manufactures of machinery, railway-carriages, oil, soap, shoddy, and tiles, and a harbour with considerable shipping. Pop. (1875) 7640.

Woad (Old Eng. *wād*) is the *Isatis tinctoria* of botanists, a biennial herb of the natural order *Cruciferæ*. It grows 1-3 feet high, is of a glaucous hue, has long-stalked oblong-obovate radical leaves, sessile stem leaves 3-5 inches long, bears crowded panicles of yellow flowers, and pendulous one-celled indehiscent short pods. The plant occurs through the Mediterranean region, in Persia, and apparently in Japan. In Britain it is probably an alien, though it is stated that the ancient Britons stained their bodies with its juice. W. was at one time much cultivated for dyeing purposes, the blue pigment being obtained by fermentation of the pulped leaves. In its present use it is always mixed with indigo, and for the required supply is still grown in parts of Europe, and in Lincolnshire in England. The genus *Isatis* contains about 30 species, mostly natives of the Orient.

Wo'burn, a town of Massachusetts, U.S., 10 miles N.W. of Boston by rail. It has 11 churches, 36 schools, 2 weekly papers, and a library. Tanning, the principal industry, has flourished here since 1673. There are also an iron-foundry, chemical works, a glue-factory, &c. The water-supply is excellent. Pop. (1875) 8560. W. is one of the oldest towns of New England, having been founded in 1640.

Wo'den. See ODIN.

Wod'row, Robert, a Scottish minister and historian, son of James W., professor of divinity in Glasgow University, was born in 1679, studied at Glasgow, and in 1703 was licensed to preach by the presbytery of Paisley. A few months later he was appointed to the parish of Eastwood near Glasgow, where he spent the remainder of his days. He died 21st March 1734.

W.'s youth was nourished on the romantic tales of Covenanting heroism during the period of persecution, and when he grew up he resolved to devote his life to recording the labours and sufferings of the National Kirk. For this purpose he opened up a correspondence with the survivors of the persecution in all parts of Scotland. The result was the publication of *The History of the Sufferings of the Church of Scotland from the Restoration to the Revolution* (2 vols. 1721). He next wrote a series of Scotch ecclesiastical biographies, the MSS. of which form fourteen folio volumes, and are preserved in the library of Glasgow University. Of these the Rev. Dr. Leishman edited for the Maitland Club *Lives of the Reformers and most Eminent Ministers of the Church of Scotland* (3 vols. Glasg. 1834–45). A singularly curious and interesting work of W.'s entitled *Analecta, or Materials for a History of Remarkable Providences, mostly relating to Scotch Ministers and Christians* (4 vols. 1842–43), was also edited for the same club by Dr. Leishman. It throws a strange light on the intellectual and moral limitations—the ignorance, superstition, and credulity of Presbyterian divines in the time of W. In 1841 a 'W. Society' formed at Edinburgh for the publication of the early writers of the Reformed Church of Scotland issued as its first work *W.'s Correspondence* (3 vols. 1842–43) under the editorship of the Rev. Thomas M'Crie.

Woj'woda (Slav. *woi*, 'warrior,' and *wodit*, 'to lead'), from being a title among Slavonic races of generals chosen in sudden emergencies, came to be borne for life by the elective princes of Poland (q. v.), Moldavia, and Wallachia, in the last two countries being superseded by Hospodar (q. v.) in 1716. See also BANAT.

Wo'kingham, a market-town of Berkshire, standing within the bounds of Windsor Forest, 7 miles E.S.E. of Reading by rail, has a parish church (rebuilt 1864), a Gothic town-hall (1860), and the endowed elementary Palmer schools (1875) for 325 children. Pop. (1871) 2868.

Wol'cot, Dr. John, better known by his *nom de plume* of 'Peter Pindar,' was born at Dodbrooke, Devonshire, in May 1738, studied medicine in London, and after some time spent in Jamaica, established himself as a physician at Truro in Cornwall. Here he discovered the genius of Opie, 'the Cornish boy in tin mines bred,' and accompanied him to London, where he spent the rest of his life in cultivating the arts of satire and ridicule, in which he reached a rare proficiency. In 1785 he published no fewer than 23 'odes,' and in 1786 his *Lousiad, a Heroi-Comic Poem*, made sport of Majesty itself. The discovery of a 'louse among a dish of green pease set before George III., resulted in a penal decree that all the servants in the royal kitchen were to have their heads shaved!' The impudent familiarity of his low humour, and the chuckling jocosity of his vulgar fancy, here found a theme at once appropriate and inimitable. W. eagerly availed himself of the opportunity, and befooled his sovereign to his heart's content. Between 1778 and 1808 he published upwards of 60 satirical pamphlets—many little better than scurrilous (though not indecent) lampoons. Poor George III. is repeatedly assailed, and in general with success. The *Peeps at St. James's*, *Royal Visits*, *Lyric Odes*, &c., were once amusing reading. Even yet, one can laugh a little at 'The Apple Dumplings and a King.' W., however, was not merely a *farceur*. He could occasionally pen a tender ballad or song. Burns with reason thought well of his 'Lord Gregory,' paying the author the sincere homage of imitation. W. died January 13, 1819, and was buried in the churchyard of St. Paul's, beside Butler. A collection of his works in 4 vols. was published in 1796; the latest, in 5 vols., 1816.

Wolf, the name applied to a species of *Carnivorous* animal belonging to the family *Canidæ* or that of the Dog (q. v.), and nearly allied to both the dog and the fox. Like the former, it has a rounded pupil, while the tail is of moderate length and is not markedly developed. The fox, on the other hand, has a linear pupil and a bushy tail. The dog interbreeds with both the W. and jackal; and some naturalists maintain that the W. is the progenitor of some of the existing races of dogs. The muzzle of the W., as in the dog, is pointed, and the tongue smooth, the claws being non-retractile. The fore-feet have five toes, and the hind feet four. The molar teeth usually number 12 above and 14 beneath. The common W. (*Canis lupus*) is widely distributed over the European continent in its northern parts, and also in northern Asia. It extends to the north of Africa and India. Within comparatively recent times the W. was plentiful in Britain. In pre-Norman times, January was known to the English as 'wolf-month.' The W. would, however, seem to have become extinct in England about the close of the 15th c. In Scotland the last W. is said to have been slain by Sir Ewen Cameron of Lochiel in 1680; while in Ireland the animal was hunted so recently as 1710. But in the forests of Russia and north-eastern Prussia, the fastnesses of the Alps, the Pyrenees, the Apennines, and the former Turkish peninsula, it is still abundant. The Common W. is an animal of powerful build and morose determined aspect, attaining a length when full grown of fully 4 feet. The fur is of a well-marked grey colour, frequently tinted with fawn, and interspersed with black hairs, and giving to the fur of the spine especially a darkish tint. The under parts are white. The tail is not bushy, but is well developed. The ears are short and erect. In winter wolves congregate in immense packs, which pursue other living beings with a steady and relentless chase. They devour their sickly or wounded companions, and when pursued the best expedient of the hunters is to shoot several members of the pack, the majority halting to devour their fallen companions. Russian villages have numberless stories—many of them tragic and even horrible in the highest degree—of the successful ferocity of these famine-maddened monsters. Even in Spain and Italy their attacks are still dreaded. In summer, and when less hardly pressed by the want of food, the W. is suspicious and cowardly, and is readily scared by dogs or even by the semblance of pursuit. The Russian Government is of course the chief power in Europe which concerns itself with the capture and destruction of these animals, and returns submitted to the Imperial Government show that the amount of injury they inflict upon live stock is very great. Variations in colour and size have given origin to the idea of the distinct and specific nature of the various breeds or kinds of W. The Black W. (*Canis occidentalis*) of N. America probably has the best title to be regarded as essentially a distinct species, the Grey W. of America is regarded by many authorities as merely a variety. A doubtful species called the Dusky W. (*C. nubilus*) inhabits the N.W. States of America, and the White W. seems merely an albino variety of the black or grey species. The Prairie W. (*C. latrans*), a well-marked American species, is named from its habitat. It is a dreaded enemy of buffaloes and deer. The Coyote (*C. schropus*) or Cajote is a species of W., resembling the fox in shape, and also inhabiting the prairie-lands of the New World. The young of wolves number from three or four to eight or nine, and the male W. is assiduous in his attentions to his mate and family. The young are usually born in March.

Wolf, Christian Freiherr von, an eminent German philosopher, was born at Breslau 24th January 1679. He studied at Jena and Leipzig, and was appointed in 1709 professor of mathematics and natural history at Halle. His teaching and writings here gave such offence to the pietist party that they raised an outcry against him, which induced the government to deprive him of his chair and oblige him, under penalty of the halter, to quit Halle in twenty-four hours and Prussian territory in two days (1723). The storm finally turned to W.'s advantage. A commission was appointed after a considerable interval to examine the case, and the result of their investigation was that the outcast was called back to Halle by Friedrich II., and appointed Professor of the Law of Nature and Nations, with the titles of Privy Councillor and Vice-Chancellor. In 1743 he became Chancellor, and was raised to the rank of a baron of the empire by the Elector of Bavaria. He died 9th April 1754. W.'s merits as a philosopher are thus stated by his German critics. 'He claimed again, in the name of philosophy, the entire field of knowledge, he made philosophical method as such an object of attention, he made German the modern language of philosophy.' To this it may be added that his principal conceptions were borrowed from Leibnitz. He divided his system into metaphysics and practical philosophy. Logic he considered as an introductory study. Metaphysics he subdivided into ontology, cosmology, psychology, and natural theology; and Practical Philosophy into ethics, economics, and politics. He discussed these subjects under a mathematical method, and without saying anything very original about them.

W.'s system, once widely popular, vanished as soon as Kant was understood. See Ludovici's *Ausführlicher Entwurf einer vollständigen Historie der Wolf'schen Philosophie* (3 vols. Leip. 1737); Baumeister's *Vita, Fata et Scripta* (1739); and *C. W.'s Eigene Lebensbeschreibung*, edited by Wuttke (Leip. 1841).

Wolf, Friedrich August, an illustrious classical scholar and critic, was born 15th February 1759 at Haynrode, near Nordhausen. Before leaving the gymnasium of Nordhausen, he had not only read the chief ancient authors, but had acquired an extensive knowledge of the languages and literatures of France, England, Italy, and Spain. In 1777 he entered the University of Göttingen, but was an irregular attendant at professors' lectures, giving himself chiefly up to intense and solitary study. As a consequence he was hardly known, and where known not particularly liked. In 1782 he was appointed rector of the *Bürgerschule* at Osterode in the Harz, and next year he was called to Halle as professor of philosophy and paideutics. Here he laboured upwards of twenty years with the highest enthusiasm for the cause of education. His ambition was to produce a great race of teachers, who should be instinct with the noblest and purest spirit of antiquity. In 1793 appeared his great work, *Prolegomena in Homerum* (3d and 4th editions by J. Vekker, with additions from W.'s papers, Berl. 1872 and 1875). In this he affirmed that the two great Grecian epics were not the work of one man, but of a number of Homeric rhapsodists, and he set himself with all his vast resources of learning and genius to prove his thesis. This 'epoch-making' work created a profound sensation, and though it may be too much to say that he absolutely succeeded in proving his contention, yet it has had the effect of profoundly and permanently modifying the opinions of Homeric scholars on the manner of the composition of the *Iliad* and *Odyssey*. From a literary point of view his labour has been of immense service. He for ever dispelled that exaggerated and unmeaning worship of 'Homer,' which, combined with an utter want of appreciation of the real merits and beauty of the Homeric poems, was so ridiculous a feature of the old classical scholarship. The University of Halle was suppressed in 1807, and W., who had repeatedly declined calls to other universities, then removed to Berlin, where he entered the ministry of Public Instruction, but soon resigned his office that he might give himself unreservedly to work of academic teaching, which was the most sacred passion of his life. In 1824 he went south, on a voyage for the sake of his health, but died 8th August of that year at Marseille. During a long lifetime devoted to classics, W. published a large number of works. Of these may be mentioned his editions of Homer (4 vols. Leip. 1794-95), many orations of Cicero, dialogues of Plato, and plays of Aristophanes, besides various works on classical antiquities. A most important and characteristic work, *Ideen über Erziehung, Schule und Universität*, was posthumously published by his son-in-law, Körte, in 1835. See Körte, *Leben und Studien F. A. W.* (2 vols. Essen 1833); Gottholdt, *Fr. Aug. W. die Philologen und die Gymnasien* (Konigs. 1843); Arnoldt, *W. in seinem Verhältnisse zum Schulwesen und zur Pädagogik* (2 vols. Braunschw. 1861-62); and Volkmann, *Geschichte und Kritik der Wolf'schen Prolegomena zu Homer* (Leip. 1874).

Wolf Hound, a species of dog used in hunting the wolf. Allied in some respects to the shepherd's dog, it is chiefly found in Norway and Sweden, but has been introduced into other European countries. The name is also given to a species of black dog bred by the Indians of Florida, which, according to Bartram, 'differs in nothing from the wolves of that country except in barking.'

Wolfe, James, an English general, son of Lieutenant-General Edward Wolfe, was born at Westerham, Kent, 2d January 1727. He was educated at Greenwich, and entered the army at an early age, becoming second-lieutenant at fifteen. He was present at the battles of Dettingen, Fontenoy, Falkirk, and Culloden, and was wounded at Lawfeldt (1747). He afterwards commanded a regiment in Scotland, and succeeded in maintaining the strictest discipline among his men, while at the same time he secured their affections in an unusual degree. W. took part in the expedition against Rochefort (1757), was made a brigadier-general in the following year, and greatly distinguished himself in the capture of Louisburg, Cape Breton, under the command of General Amherst. On his return to England Pitt determined to trust him with the command of the expedition he was planning against the French possessions in Canada. His fleet was a strong one, but was unable, owing to the draught of the vessels, to co-operate with him against Quebec. The land forces, on the other hand, amounted to rather less than 8000 men, and with these he had to attack a town whose situation rendered it almost impregnable, defended by a large French force under an intrepid and able leader, Montcalm. On the 8th of June 1759 he landed on the Ile d'Orleans, whence he commenced an ineffectual bombardment of the town. He next attacked the French works at the mouth of the Montmorency (31st July), but was repulsed with considerable loss. At last the advance of the season and the reduction of his troops by sickness, &c., forced him to make a decisive effort. On the night of the 12th September he took 3600 men in boats to a point about two miles above Quebec. Before morning they had scaled the Heights of Abraham, which commanded the city. Montcalm left his trenches to dislodge them from this position, and a fierce conflict resulted in the total defeat of the French. Unhappily both generals were mortally wounded. W. died in the moment of victory, saying, 'God be praised! I die happy.' His adversary lived until next day. Four days afterwards Quebec fell, and the final blow was struck at the French power in Canada. W. was buried in the parish church of Greenwich, and the House of Commons voted him a monument in Westminster Abbey. He was a man of singularly pure and lofty character, and would probably, had he lived, have been a great general. See Wright's *Life of Major-General James W., founded on Original Documents and Illustrated by his Correspondence* (Lond. 1864); also Thackeray's *Virginians*.

Wolfe, Rev. Charles, born at Dublin, 14th December 1791, was educated at Winchester and Dublin University, where he graduated B.A. in 1814. His verses on the *Burial of Sir John Moore* were written in 1817, and soon after found their way anonymously into the newspapers. No poem perhaps ever thrilled a nation more instantaneously; and it falls upon the ear to-day as freshly and powerfully as it did sixty years ago. It is the perfection of true-hearted pathos: an incident at once romantic and sublime is recorded with a patriot's pride and a soldier's emotion. Having taken orders, W. became successively curate of Ballyclog in Tyrone and rector of Donoughmore. Consumption, unhappily, soon showed itself in his system, and after some unavailing attempts to fight the enemy by visits to the S. of England and France he died at the Cove of Cork, 21st February 1823. His *Remains*, chiefly sermons and poems, were first published in 1825 by the Rev. John A. Russell, Archdeacon of Clogher.

Wolf'enbüttel, a town of Brunswick, Germany, on the Ocker, 13 miles S. of Brunswick by rail. It is an old town with 4 churches, the largest of which is that of St. Mary, and a ducal palace, part of which is now converted into a theatre, and part used as a manufactory of tapestry. Opposite this is the Pantheon, built on the model of that at Rome in 1723, and containing in its upper story the famous W. library, with 300,000 volumes, including more than 10,000 MSS., 800 Bibles, Luther's Bible with autograph notes, and other relics of the Reformers. According to the *Academy*, January 11, 1879, the state of this library is disgraceful, with walls and ceilings falling in, and the valuable collection perishing from damp and decay. W. manufactures leather and yarn, and has also iron-foundries, copper-smelting works, &c. There is a trade in corn and vegetables. Pop. (1875) 11,105. The town, which is very ancient, was the residence of the dukes of Brunswick-W. until 1754.

Wolf'enbüttel Frag'ments. See Lessing and Reimarus.

Wolff'ian Bod'ies, or **Primor'dial Kid'neys**, are two organs developed in *Vertebrate* animals. In man they appear at about the third week of intra-uterine life, and are situated one on each side of the primitive spine. Above, each Wolffian body ends blindly, and opens below into the bladder. In structure the Wolffian body resembles the Kidney (q. v.). It has an excretory canal resembling the Ureter (q. v.), and exhibits a glandular and tubular structure comprising Malpighian tufts and bodies. The W. B. are attached to the *diaphragm* by a *superior ligament*, and to the spine by an *inferior ligament*. The W. B. secrete urine from the blood of the fœtus, but they are partly absorbed in the formation of the true and permanent kidneys, and partly assist in the formation of the genital organs. The *ducts* of the W. B.

in the male ultimately become the *vas deferens* and *ejaculatory duct*; but in the female, the Wolffian ducts entirely disappear. It is worthy of note that in fishes and amphibians the W. B. remain permanently as the kidneys of adult life.

Wolf Fish (*Anarrichas lupus*), also named Sea Cat and Swine Fish, is a *Teleostean* fish, allied to the Blenny (q. v.), and deriving its name from a peculiar development of the teeth, which consist of front incisors, above shelved, interlocking in an exact manner, three rows of palatal grinding teeth, and two rows of similar teeth in the lower jaw. The W. F. may attain a length of 4 or 5 feet. The dorsal and anal fins are long and single, and the tail fin is unforked. The colour is an olive-green above, marbled with brown on the head especially. The fish feeds on molluscs and crustaceans. Dr. A. Wilson, describing his dissection of a W. F. (*Nature*, April 1879), mentions that the stomach contained starfishes, shells, gravel, and crustaceans. The skin is glutinous. The W. F. is said to be fierce, and to attack its captors. The flesh tastes like that of cod. An allied species (*A. vomerinus*) is found off the American coasts.

Wolf'ram von Esch'enbach. See ESCHENBACH.

Wolf's Bane. See ACONITE.

Wolf Spider, a name given to spiders of the genus *Lycosa*, in which the body is large and hairy, and in which the fourth pair of feet is larger than the other pairs. It makes no web, but roams about in search of prey, and hides beneath stones. *L. Tarantula* is the Tarantula (q. v.) of Italy.

Wol'gast, a town of Prussia, province of Pommern, on the left bank of the Peene, 4½ miles from its influx into the Baltic, and 40 miles S.E. of Stralsund by rail. Its harbour is shallow, and larger vessels load and unload on the Ruden, an island at the river mouth. W. has the remains of an old castle, the ancestral seat of the Dukes of Pommern. Its industries are weaving, boat-building, and the manufacture of leather and tobacco. It has also an active trade in ships' stores. Pop. (1875) 7269. W., which was strongly fortified early in the 12th c., was destroyed in 1628 by Wallenstein, in 1630 by the Swedes, in 1637 by the Imperialists, and in 1638 again by the Swedes. In 1675 it was taken by the Great Elector, was plundered by the Russians in 1713, and by the Swedes again in 1715. But small remains now exist of its former fortifications.

Woll'aston, William Hyde, M.D., F.R.S., was born in Charterhouse Square, London, August 6, 1766. He entered Caius College, Cambridge, where he took the degree of M.D. in 1793. The same year he was elected a fellow of the Royal Society, of which he was chosen one of the secretaries in 1806. Though he settled in London with the intention of entering into practice as a physician, he soon decided to devote himself wholly to the pursuit of science, and in the departments chiefly of chemistry and optics he has earned a lasting reputation. Not content to discover new truths, he strove to direct these to practical ends; and from many of his applications, notably the method of manufacturing platinum, he amassed a considerable fortune. His first contribution to the *Philosophical Transactions* is an essay on *Gouty and Urinary Concretions* (1797), in which he records the discovery of some new chemical compounds, phosphate of lime, oxalate of lime, and ammonia-magnesium phosphate. In 1804 and 1805 he discovered palladium and rhodium, and in 1809 identified the supposed new metal tantalum with columbium previously discovered by Hatchett. He proved the identity of frictional and voltaic electricity, and made many valuable researches into the phenomena attending the action of the cell. In optics he is best known as the inventor of the camera lucida, the goniometer for measuring angles of crystals, and the cryophorus for freezing water by its own evaporation; and in the *Philosophical Transactions* for 1803 there is published a valuable paper *On the Oblique Refraction of Iceland Crystal.* His 'Bakerian Lecture,' *On a Method of Rendering Platina Malleable*, is published in the *Philosophical Transactions* for 1829. W. died December 28, 1828.

Wolse'ley, Sir Garnet Joseph, the eldest son of Major W., a cadet of an ancient Staffordshire family, was born June 4, 1833, at Golden Bridge House, county Dublin. He entered the army in 1852 as ensign in the 80th regiment, but the greater part of his regimental service was with the 90th foot. W. first smelt powder in the second Burmese war of 1853, when he was severely wounded in leading a storming party. After Inkerman he went to the Crimea, and was again dangerously wounded in a hand-to-hand fight in the trenches. He next served through the entire Sepoy War of 1857-58, during the later portion on the staff of Sir Hope Grant. At the second relief of Lucknow he was one of the first to enter the Residency. In 1860, now a brevet-colonel, he accompanied Sir Hope Grant to China as head of the topographical department, and witnessed the capture of the Taku forts and the plunder of the Summer Palace at Pekin. After a holiday in England of only a few months, he embarked for Canada in 1861, on the alarm of the *Trent* affair, and here he remained almost continuously until 1871, first obtaining an independent command as chief of the Red River Expedition in 1870. The unqualified success of that arduous expedition gained for him the honour of knighthood and the appointment of Assistant Adjutant-General in the Horse-Guards. In the autumn of 1873 he was appointed to the supreme military and civil command on the Gold Coast, and in a few short months broke the power of the Ashantees, and burnt their capital of Coomassie. As compared with earlier and later savage wars, it may be said that none was ever so successful and so cheap as this. On his return he was rewarded with a grant from Parliament of £25,000, and the rank of Major-General. In 1875 he was sent to Natal as temporary governor, to set in order the disturbed affairs of the colony, in 1878 to Cyprus as High Commissioner and Commander-in-Chief, and in May 1879 to South Africa as Governor of Natal and the Transvaal, and invested with supreme civil and military authority in the territories disturbed by the Zulu war. Sir Garnet W. is the typical representative of the modern officer, who combines intellectual training with professional zeal. His *Soldier's Pocket-Book for Field Service* (1st ed. 1869; 3d ed. 1875) is the model treatise of scientific warfare applied to practical details. He has published various other papers of military subjects. See C. R. Low's *Memoir of Sir Garnet J. W.* (2 vols. Lond. 1878).

Wol'sey, Thomas, son of a well-to-do Ipswich townsman, was born in March 1471, and from the free school of his birthplace went up to Magdalen College, Oxford, where, graduating in his sixteenth year, he gained the nickname of 'Boy Bachelor.' To a college fellowship was joined the mastership of Magdalen School, and from the Marquis of Dorset, father of three of his pupils, he received the living of Limington, Somersetshire, in 1500. His second patron was Archbishop Deane, his third Sir John Nafaut, Treasurer of Calais; and by the latter, whom he served as deputy, he was brought to the notice of Henry VII. His great abilities, coupled with dexterous addresses to Fox and Lovel, the reigning favourites, raised W. high in Henry's favour; and, sent on an embassy to Flanders, he added to skilful conduct such singular despatch that the king chid him for not having started yet, when in fact he appeared to notify his return—a feat rewarded with the deanery of Lincoln (1508). His negotiations for Henry VII.'s marriage to Maximilian's daughter, Margaret of Savoy, were frustrated by Henry's death (1509); but with W. a change of masters meant always a rise to fresh advancement. Fox, casting about for a rival to Surrey's influence, made him king's almoner, and for reward was himself supplanted by W., who by debonair ministering to royal pleasures and subtle flattery of royal vanity soon 'took,' says Cavendish, 'the length of young Harry's foot, and fitted it with an easy shoe.' All state business was now disposed by W., and most church preferments were bestowed on him—the rectory of Torrington (1510), a Windsor canonry (1511), a prebend of York (1512), its deanery and the French bishopric of Tournay (1513), the see of Lincoln and the archbishopric of York (1514), to which were added the temporalities of other wealthy dioceses and enormous pensions from various foreign powers. In 1515 he was made a cardinal, and succeeded Warham as lord chancellor; in 1519, after three years' delay, Henry procured him the legatine authority, which formed the keystone of his proud position. His policy from the first was one of peace, a peace in which absolutism grew side by side with the New Leaving and outward prosperity, whilst king and minister cherished each his own ambition, Henry of the imperial and W. of the papal crown. The balanced contest between France and Spain lasted ten years (1513-22), and though the Spanish cause was popular as ever with the English nobles, no man durst wag his head in discontent, lest it fell off with Buckingham's. But Henry, still nursing hopes of winning

back his 'French inheritance,' and ascribing to François I. his failure to seat himself upon Maximilian's throne (1519), was bent on a second war with France, and W. must needs submit,—Karl V., to make sure of him, engaging to secure his election to the see of Rome. Twice it fell vacant (1522-23), and twice was the cardinal duped, whilst at home his attempts to meet the expenses of useless French campaigns by arbitrary taxation and benevolences resulted in defeat. Pavia gave everything to Karl, to Henry nothing; and in the flush of his master's disappointment W. was able not only to renew the French alliance, but to exact as its price £285,000. Revenge and ambition, each prompting a final rupture with the Emperor, might both be gratified by divorcing the heirless Catherine and marrying Henry to a French princess. Catherine was the Emperor's kinswoman, and the head of the Spanish party, and Henry had grown estranged from her since 1524; but a wife to his liking could only be had through a pope of his own choosing, and W. designed that choice should fall upon himself. The scheme's success made it essential jealously to uphold the papal prerogative, and at the same time hinder the reigning Pope from delivering sentence, so that Henry and François, weary of delays, might end by making W. antipope. This object he so steadily pursued, even after a passion for Anne Boleyn had superseded Henry's conscientious scruples (1527), that he rejected Karl's stupendous bribe not to accept the patriarchate of Gaul. But Henry's desires, outstripping W.'s policy, brought matters to an untimely crisis; and when, after four years spent in vacillating negotiations, Karl by the mouth of Clement VII. cited the case to Rome (1529), the cardinal knew that his doom was sealed, if only by the Boleyns' enmity. Charged with transgression of the Statute of Præmunire, he temporarily staved off ruin by sacrificing dignities and that vast wealth whose noblest use had been the foundation of the colleges of Christ Church (q. v.) and Ipswich. Part of it was restored to him, and he was suffered to retire to his archbishopric; but only to be re-arrested in the midst of preparations for a magnificent installation, and brought towards London. Dysentery attacked him on the way, and at the Abbey of Leicester he breathed his last, 29th November 1530. As founder of an overwhelming despotism, as a bitter religious persecutor, and as a priest of immoral life, the low-born cardinal deserves more wonder and censure than pity and admiration. His influence on English history was great, since 'his long tenure of the whole papal and civil authority within the realm led men at a later time to acquiesce in Henry's own supremacy.' See the Lives of him by Cavendish (ed. by Holmes, Lond. 1852), Fiddes (Lond. 1724), Galt (Lond. 1812), and Martin (Lond. 1862); also Froude's *History of England* (vols. i.-ii. 1856); Brewer's *Letters and Papers of the Reign of Henry VIII.* (4 vols. Lond. 1862-75); and Lord Acton's *W. and the Divorce* in the *Quarterly Review* (January 1877).

Wolverhamp'ton, a town of S. Staffordshire, England, 12¾ miles N.W. of Birmingham by rail, stands upon rising ground amid a network of railways and canals. Of its numerous churches the finest and most ancient is the cruciform St. Peter's, which, dating from the 14th c., was enlarged and elaborately restored (1859-65). Later edifices are St. Philip's (1859), St. Luke's (1861), St. Andrew's (1866), and St. Jude's (1868), all in First Pointed style, as also are E. Pugin's Catholic church (1867) and a Wesleyan chapel (1863), with a spire 115 feet high. The public buildings include a town-hall (1868), corn-exchange (1852), market-hall (1853), agricultural hall (1863), theatre (1856), free library (in connection with which a Naturalists' and Archæological Department was formed in 1876), an Athenæum, concert-hall, &c.; and there are also an orphanage for 200 children (1868), the S. Staffordshire Hospital, and a free grammar-school (founded 1515; rebuilt 1874). In the triangular open space in the centre of the town, formerly and still partially used as a market-place, the Queen unveiled (1866) a bronze equestrian statue of the Prince Consort; and in June 1879 Earl Granville unveiled in front of the Agricultural Hall a statue of the Right Hon. C. P. Villiers, the senior borough member. Lock-making has for now two centuries been W.'s staple industry, next to it rank tinplate-working, japanning, and galvanising, and there are besides large iron and brass works, smelting furnaces, chemical, coal, grease, colour, and varnish works, and in the neighbourhood collieries, ironstone mines, and quarries. W. publishes one daily and three weekly newspapers, and its parliamentary borough (with a pop. in 1871 of 156,078) returns two members to Parliament. Pop. (1801) 12,556, (1879) 75,100.

Wol'verine. See GLUTTON.

Womb, or **U'terus,** the organ in which the young of *Mammalia* (q. v.) are developed and protected, and from which at birth they are expelled. It essentially consists of the united *oviducts* or *Fallopian tubes*—the ducts leading from the *ovaries* (see OVARY) to the external surface of the body. Thus in birds and in the lowest quadrupeds or *Monotremata* (q. v.) the oviducts simply open into a *cloaca* or chamber common to the efferent ducts of the urinary and digestive systems, without uniting to form a W. In the kangaroos and other *Marsupialia* (q. v.) there is a similar condition of the W., but in the latter animals the two oviducts open into two vaginal tubes, and these in turn open into a *urogenital canal*, which, however, is distinct from the *rectum*. In higher or *placental* Mammalia the oviducts coalesce to form a true *uterus* or W., which may, however, exhibit, as in the horse, traces of its double nature in the presence of two *cornua* or 'horns' at its fundus or base. In the pig these cornua are extremely elongated, but in Rodents, such as the rabbit, the organ is truly double. The uterus or W. is thus to be viewed as a special development of the oviducts, and the impregnated ova from the ovaries, passing down the oviducts, rest in the W. and there undergo development. The W. communicates externally by the *Vagina* (q. v.), through which the child is expelled at birth.

The W. of the human subject is, in the virgin or unimpregnated state, a pear-shaped organ, slightly flattened from before backwards. It lies in the *pelvis*, between the bladder above and the rectum or last portion of the bowel beneath. The fundus upper end or base is directed upwards and forwards, its lower extremity downwards and backwards. The average length of the W. is 3 inches, its breadth 2 inches, and its thickness about 1 inch. The average weight is about 1½ ounces. The body of the W. gradually narrows from above downwards until it opens into the vagina by a neck or *cervix*, at the extremity of which is the *os uteri* or mouth of the W. This aperture is transverse and is bounded by two lips, of which the anterior is thick, and the posterior long and narrow. The W. is kept in its place by means of *six ligaments*. These are (1) the *Vesico-uterine* or *anterior ligaments* attaching the organ to the posterior surface of the bladder; (2) the *recto-uterine* or *posterior ligaments* attaching the W. to the rectum; and (3) the two *broad* or *lateral ligaments* by means of which the W. is attached to the walls of the pelvis. On dissection the W. is found to present a small internal cavity, its walls being proportionally very thick. The cavity of the *cervix* or neck has a corrugated appearance named the *arbor vitæ*. The oviducts or Fallopian tubes open into the organ at its base by two minute apertures. The W. consists of three coats or layers. The external coat is of *serous* nature. The middle coat is *muscular*, and is composed of unstriped fibres dispersed in layers, this coat undergoing a great thickening during pregnancy. The inner or *mucous* coat is thin and smooth, and is closely adherent to the middle coat. This inner coat is of reddish colour, and is lined by ciliated *epithelium*, whilst it is provided with numerous mucous follicles and glands. During menstruation, the lining membrane of the W. undergoes important changes, and appears to be renewed after each menstrual period. The W. derives its *uterine arteries* from the internal iliac trunks, the *ovarian arteries* of the W. coming from the *abdominal aorta*. The arteries of the W. have a very tortuous course, and the veins are large, constituting in the pregnant uterus the *uterine sinuses*. The nerves of the W. are derived from the *inferior hypogastric* and *spermatic plexuses*, and nervous filaments are also supplied to the W. from the third and fourth *sacral nerves*. In old age the W. becomes smaller, and the *internal os*, as well as the external *os uteri*, may be obliterated. During pregnancy the W. increases in weight from 2 to 3 lbs., and becomes enormously enlarged, extending upwards into the abdominal cavity.

Diseases of the W.—The W. is subject to a great variety of diseases, the more important of which are the following. (1.) *Endometritis*, or inflammation of the lining membrane of the W. It may be acute or chronic, and may affect the lining membrane of the cervix, or of the body alone, or it may be general and attack the whole mucous uterine tract. The most

frequent causes are cold from exposure during menstruation, suppression of menstruation, vaginitis, and constitutional diseases of septic or asthenic character, such as measles, scarlatina, &c. The symptoms are pain, weight and dragging in the pelvis, and pain in the back, groins, and thighs, vesical and rectal tenesmus, and, after a time, uterine tenesmus. After a few days there is a muco-purulent discharge which may induce vaginitis. Early treatment is of primary importance, and should consist in complete rest of body and mind. In severe cases the horizontal position should be rigidly maintained. Opium, or its preparations, should be given in full doses. A warm linseed poultice, covered with oiled silk, should be applied over the hypogastrium. The diet should consist of fluid food chiefly, as milk, beef-tea, &c. When the discharge begins to show itself, the vagina should be syringed with copious injections of warm water, or with demulcent infusions of linseed or starch, or infusion of poppies, and this treatment should be persevered in three or four times daily until recovery, or until the disease may have passed into the chronic form. The acute form of endometritis usually implicates the entire mucous membrane; but the chronic form may be limited to the cervix or the body. The lining membrane of the body of the W. is also liable to chronic inflammation, the affection being sometimes called *uterine catarrh*, *uterine leucorrhœa*, and *internal metritis*. The utricular follicles are the seat of the disorder, the uterine leucorrhœa being an exaggeration of their secretory functions. The chief symptoms are leucorrhœa; menstrual disorders; pain in the back, groins, and epigastrium; nervous disorders, as neuralgic headache and hysteria; tympanitis and sterility. In the treatment of such cases means should be adopted for sustaining and improving the general health of the patient. Iron, the mineral acids, quinine, bromide of potassium, or nux vomica may be administered.

(2.) *Areolar hyperplasia* of the W., or *chronic parenchymatous metritis*, is a disease of the W. of very frequent occurrence, and, as a general rule, is a consequence of subinvolution. When the affection involves the entire W., the more prominent symptoms are a dull, heavy, dragging pain through the pelvis, much increased by locomotion; a dull pain beginning several days before menstruation, and lasting during that process; also pain in the mammæ; pressure on the rectum and bladder, with tenesmus; nausea and vomiting, and great nervous disturbance. In such cases, general hygienic treatment is of the utmost importance; ferruginous and vegetable tonics should be administered; and, during the stage of enlargement, ergot, kept up for a considerable time, produces good results. The local or topical treatment is of a complicated nature, consisting in depletion, vaginal injections, the warm sitz-bath, the local application of alteratives, and the excision of a portion of the neck of the W., or its removal by means of the galvano-cautery. (3.) *Granular degeneration of the cervix* of the W. consists in a granular development on the smooth face of the cervix, just within the os, and is a concomitant of most of the diseased conditions of the parenchyma and lining membrane. Profuse leucorrhœa may be the only prominent symptom.

The foregoing diseases of the W. are very frequently complicated with *displacements* of the W., of which there are several varieties. (1.) *Descent* or *prolapsus* of the W., popularly known as *Falling of the Womb*, is of frequent occurrence, and may occur very suddenly and unexpectedly, or gradually and by successive steps. The most frequent predisposing causes are child-bearing, laborious occupations, advanced age, and habitual constipation. The exciting causes are (*a*) those increasing uterine weight; (*b*) those enfeebling uterine support; (*c*) those forcing the W. down by force applied above; and (*d*) those drawing it down by traction from below. The treatment consists in removing the cause in so far as it is removable, and in supporting the prolapsed W. by some mechanical contrivance, of which there are several, or by an appropriate surgical operation. (2.) *Anteversion* of the W. is an anterior inclination of the W. so that the fundus approximates the symphysis pubis, and the cervix retreats into the hollow of the sacrum. (3.) *Retroversion* of the W. is a posterior inclination of the W., so that the fundus approaches the sacrum and the cervix advances towards the symphysis pubis. (4.) *Flexions* of the W. are of frequent occurrence, and give rise to many distressing symptoms. (5.) *Antiflexion* is a bending of the organ, so that the fundus, the cervix, or both, are bent more or less sharply forwards. (6.) *Retroflexion* is the bending of the body of the W. towards the sacrum, so as to create an angle on the posterior wall. (7.) *Lateroflexion* is a bending of the W. to the right or left side as a consequence of disease of its proper tissue, or direct pressure. All these conditions of displacement and flexion may be mitigated by the mechanical support of specially adapted pessaries. (8.) *Inversion* of the W. is the turning of the W. inside out, and the inversion may be partial or complete. There are various methods of replacing the inverted W., but the affection is a very serious one; and, in some cases, it may be necessary to remove it by operation.

The W. may also be the seat of various tumours, the more important of which are the fibrous and the fibro-cystic. *Fibroid tumours* of the W. most frequently appear in the body or fundus, and they may develop singly or in considerable numbers, and attain a great size. The simple tumour, which is single, is generally spherical, and is connected by loose connective tissue with the W. The compound tumour is made up of a number of small fibroids, connected by loose connective tissue. These tumours are called submucous, when they lie under the mucous membrane; subserous, when under the peritoneum; and interstitial, when in the walls of the W. The treatment, in the great majority of cases of the interstitial and subserous variety, is merely palliative.

Cysto-fibromata, or *fibro-cystic tumours* of the W., are not of very frequent occurrence, and up to the year 1869 only fourteen cases had been recorded, two of which had been discovered by post-mortem examination. *Polypus* of the W. is a tumour covered by the mucous membrane of the W., attached by a pedicle or stem, and originating in a hypertrophy of some of its proper tissues, the muscular, the connective, or the glandular. The varieties of polypus are the cellular, the glandular, and the fibrous. The *cellular polypus* is a pear-shaped tumour, varying in size from a marble to a hen's egg. It consists of connective tissue in a state of hypertrophy, and is covered with mucous membrane. It is generally attached to one wall of the cervix, and sometimes the pedicle is very long and slender, so that it hangs outside the vulva. The *glandular polypus* consists in hypertrophy of the Nabothean glands, or of the utricular follicles, and arises more frequently from the cervix than from the body. The *fibrous polypus* is a submucous fibroid tumour which, being slowly extruded from the uterine parenchyma by its contraction, acquires a pedicle and the characteristic form of a polypus. They usually arise from the body of the W., but occasionally from the rim. The treatment may be either palliative or curative. The palliative treatment consists in keeping the W. in position by an appropriate pessary, keeping the patient in bed during the menstrual periods, and giving cannabis indica, gallic acid, or ergot. During the inter-menstrual periods, ergot should be given freely to favour extrusion of the polypus. The curative treatment consists in removing the polypus by either of the three following methods; excision, torsion, and traction; ecrasement, or the galvano-caustic wire.

Sarcoma, or Cancer of the W., is the most dreaded of all diseases. Of late years it has been described by German pathologists and surgeons as a disease distinct from cancer, though in many features closely resembling it. In sarcoma, the cells are merely exaggerated reproductions of those of the mother tissue; but in cancer the cells are heteroplastic to the mother tissue. The distinction, however, can only be made out by the microscope. Between cancer of the W. and the same affection in other parts of the system there are no marked differences. The most frequent form of cancer of the W. is the medullary, which is, both in its development and subsequent course, the most acute of all cancers, so that the prognosis is extremely unfavourable. Sir James Simpson gives an average duration of the disease of from 2 to 2½ years; Lebert, about 16 months; West, about 15 months; and Barker, about 3 years and 8 months. Death is usually due to hæmorrhage, or irritative fever of a typhoid form; or from some one of the numerous complications which accompany the disease.

The treatment of cancer of the W. is of a very unsatisfactory nature as regards cure, the disease and many of its complications being entirely beyond the resources of art. If detected early, and if the disease is confined to the cervix, the cervix should be removed by amputation. If the disease be scirrhus or encephaloid cancer, some relief may be afforded; but if it be epithelioma, a cure may be affected. The best mode of operating is by the

galvano-cautery, for by it the blood-vessels and the lymphatics are sealed up. The operation, although it may not permanently cure, prolongs life. If the diseased portion cannot be completely removed, it should be destroyed as far as possible by such means as strong acids, by potassa cum calce, by the gas-jet cautery, or by the galvano-caustic knife. Relief from pain may be afforded by the administration of opium by the mouth, the rectum, the vagina, or under the skin, or chloral hydrate may be given in scruple doses. The fœtor of the discharges may be corrected by the injection of solutions of carbolic acid, permanganate of potash, persulphate of iron or of the iodide of lead. There are no specifics for the cure of cancer, but tonic medicines may be given, and the strength should be supported by generous diet and fresh air, a residence in the country if possible, and the administration of stimulants. Abundance of milk and beef tea should be given, iron should be freely administered, and quinine will be found to be the most efficacious of tonics. See *A Practical Treatise on the Diseases of Women*, by T. Gaillard Thomas (Philad. 1878); and *A Handbook of Uterine Therapeutics and Diseases of Women*, by Edward J. Tilt (Lond. 1878).

Wom'bat (*Phascolomys fossor*), a species of *Marsupialia* (q. v.) found in Australia. Its food consists of roots and vegetable matters; the teeth have two incisors, two premolars, and eight molars in each jaw. Canine teeth are wanting. The incisors and molars grow from permanent pulps, a character in which the W. differs from all other marsupial mammalia. The animal has a stout body and short legs. The body is covered with a brown woolly fur, but the tail is extremely short. The average length is 3 feet. The W. lives in burrows, which it excavates by means of the strong digging-claws with which its forefeet are provided.

Women's Rights, the name applied, sometimes in derision, to the claims for the political and social enfranchisement of women put forward by a certain school of modern thinkers. It is to the influence of such women as Madame Roland and Madame de Staël, Mary Wollstonecraft and George Sand, that the movement in reality owes its origin, but it first took definite and practical shape in America, where an agitation was commenced in 1848, growing, strange to say, out of the anti-slavery agitation, with which it would seem at first sight to have little connection. 'Conventions' were held in different cities, and were largely attended, and for the most part conducted, by women. The political portion of the movement was headed by such women as Amelia Bloomer, Lucretia Mott, and Susan B. Anthony, while their followers earnestly strove to fight their way, not only to the franchise, but to higher education and the learned professions. Annual conventions were held in New York from 1852 to the outbreak of the war, and Women's Suffrage associations were established throughout the country. In 1869 the elective franchise and the right to sit on juries were granted to women in Wyoming Territory, and in the following year the franchise was granted in Utah. A female suffrage proposal passed the lower house of the Iowa legislature in 1876, and was barely thrown out in the Senate. In that State women have long held appointments as notaries, public school superintendents, &c., while in Illinois and one or two other States the legal profession is open to them. A 'Woman's Declaration of Independence' was presented to the President on the Centennial Independence day, 4th July 1876. There are ten or a dozen W. R. journals in America edited, and for the most part written, by women. In general journalism, too, women are very largely employed. Female doctors are very numerous, having gained their diplomas either at American colleges, of which five or six undertake the medical education of women, or on the Continent. In the other learned professions, the Church not excepted, prominent positions are occupied by women. There are in America numerous admirable institutions for the higher education of women; on the lecture-platform women are popular and successful; and since the time of the war they have been employed as clerks in the government offices in Washington.

In this country the agitation may be said to have been set in motion almost entirely by John Stuart Mill and Mrs. Taylor, the lady who afterwards became his wife. She published in 1851 an article in the *Westminster Review*, which ably and powerfully directed attention to the question, and since then the cause of female suffrage, education, and professional activity has steadily advanced through much ridicule and obloquy, gradually gaining influential adherents, and becoming more and more popular with the general public. The political branch of the agitation is less flourishing than the others. A petition for the abolition of the electoral disabilities of women was presented to the House of Commons in 1866, and on May 2d, 1867, John Stuart Mill moved an amendment to the Reform Bill in favour of female suffrage, which was negatived by 196 to 73. The bill for the same object which is brought forward annually by Mr. Jacob Bright, Mr. Forsyth, or Mr. Courtney is always rejected by a large majority. In 1871 it was lost by 220 to 157 votes; in 1872 by 222 to 143; in 1873 by 222 to 155; in 1874 it was withdrawn; lost in 1875 by 187 to 152; in 1876 by 239 to 152; 'hustled out' in 1877; and lost by 219 to 140 in 1878. Thus, though the minority in favour of the bill cannot be said to increase, the interest which the question excites is shown by the comparatively large number of votes given on each side. Meanwhile agitation outside Parliament has been actively carried on. The National Society for Women's Suffrage held its first annual meeting at Manchester on the 30th October 1868, and has issued numerous tracts and pamphlets for the dissemination of its opinions. A monthly paper called *The Woman's Suffrage Journal* is published in Manchester under the editorship of Miss Lydia Becker, and opinions favourable to W. R. are also advocated by *The Englishwoman's Journal*, published in London. It is impossible to refer to the numerous papers on the subject to be found in all the leading magazines and reviews, for the most part from the pens of Mrs. Fawcett, Mrs. Hill, Miss Becker, Miss Frances Power Cobbe, and Miss Helen Taylor. The admission of women to the municipal franchise (1869) was a step in advance, as was also the Education Act of 1870 (Scotland 1872), which not only gave women a vote in the election of school-boards, but made them themselves eligible. Mrs. Garrett Anderson and Miss Davies were returned by an immense number of votes to the first London school-board, and the example of the metropolis was followed by Manchester, Edinburgh, and several other large towns.

Much more progress, however, has been made towards throwing off educational and industrial disabilities than towards acquiring political rights. The higher education of women is being promoted by institutions ranging from such establishments as Girton College, Cambridge (two similar colleges have just been founded [1879] at Oxford), down to the Girls' High Schools established in different quarters of London. In 1869 the University of Cambridge established periodical local examinations throughout the country to encourage and test the progress of female education, and the example has been followed by several other universities. In 1878 the University of London obtained a charter empowering it to grant degrees to women, who are now admitted to all classes at University College. The Medical Act of 1876 permitted the registration of women, and there are now many students at the Medical School for Women founded in 1874. A large number of students, however, go abroad. The medical school of the University of Zürich has since 1864 been largely frequented by female students. The University of Paris also grants medical diplomas to women; while the German Universities, notably Berlin and Vienna, afford considerable facilities for private instruction. In the industrial arts, too, women are rapidly forcing their way, while their employment in post and telegraph offices, &c., and even in commercial occupations, is becoming more and more common. The 'lady-help' idea, recently so much discussed, is an invention not so much of the supporters of so-called W. R. as of their opponents, who hold domestic occupation to be the only natural sphere for female activity.

On the Continent the question of W. R. has been a good deal mooted, though not so actively as here and in America. In France the movement has never taken very strong hold. *L'Avenir des Femmes* is the name of a paper published in Paris for the discussion of questions connected with W. R., and several attempts have been made to get up an active agitation, but for various reasons Frenchwomen as a body stand even more aloof from the movement than the women of most other countries. In Switzerland women vote in every canton, and the opinions of the advanced party are represented by a paper, *Le Droit des Femmes*. In Italy there are two papers advocating W. R.—*La Donna*, published in Venice, and *La Cornelia* in Florence. There has been a good deal of agitation on the subject in Germany, Den-

mark, and Russia; but in these countries 'emancipated' women, as they are called, are looked on with even less favour than in English-speaking lands. A newspaper, *Das Frauenwelt*, is published in Berlin. In Sweden women have a right to vote on certain questions, and are admitted to the University of Upsala. See Mary Wollstonecraft's *Vindication of the Rights of Women* (Lond 1791); J S. Mill's *The Subjection of Women* (Lond. 1869) and his *Dissertations and Discussions* (Lond 1859-67); Margaret Fuller Ossoli's *Woman in the Nineteenth Century* (New York 1845; revised 1855); L. M. Child's *History of the Condition of Women in all Ages and Nations* (New York 1845; 5th ed. 1854); M. J. M'Intosh's *Woman in America* (New York 1850); E C Smith's *Woman and her Needs* (New York 1851); C. H. Dall's *Woman's Rights under the Law* (Boston 1862); V Penny's *The Employment of Women* (Boston 1863); E. W Farnham's *Woman and her Era* (New York 1864); C H Dall's *The College, the Market, and the Court* (Boston 1867); J. Todd's *Woman's Rights* (New York 1868); *The Rights of Women A Comparison of the relative Status of the Sexes in the Chief Countries of Western Civilisation* (Lond. 1875); Luisa Buchner's *Die Frauen und ihr Beruf* (Frankf 1855; 3d ed. 1860); Bohmert's *Das Studiren der Frauen* (Leip 1872); Von Bischoff's *Das Studium und die Ausubung der Medecin durch Frauen* (Munchen 1872); Schonberg's *Die Frauenfrage* (Basel 1872); Dora d'Istria's *Des Femmes par une Femme* (Par and Bruss. 1864); and Jenny d'Hericourt's *La Femme Affranchie* (Par. 1860).

Woochang', a town in the interior of China, province of Hu pe, on the Yang-tse kiang, opposite the important trading town of Hankow (q. v) It stands amid cotton-plantations and rice-fields, and is a great emporium for tea, which is exported to Britain *via* Shanghai. Hankow is virtually a suburb, and another considerable section of the town on the N bank of the river is Hang-yang fu. The pop of W., including the outlying portions, is estimated at 1,000,000

Wood, in a botanical sense, consists of the hard, solid, non-succulent stem of any plant, and chemically it consists of lignin, a hardened form of cellulose, the principal constituent of all vegetable life, with a small proportion of resinous and incrusting matter W. thus only differs from vegetable fibres—cotton, flax, hemp, &c —in its physical condition. Woody stems are divided into two great classes, according to the manner in which they grow The first and most important class is the exogens or exogenous stems, so called on account of the annual increments being added on the outside of the stem just within the bark, and the layers of growth are seen in such stems in a series of concentric circles, each ring of which represents the growth of one year. This class embraces all the trees of temperate climates, and, indeed, the greater part of all tree life. The second class —endogenous stems—shows no rings of annual growth, but a cross section exhibits a series of dark spots, more or less closely studded, and always more densely packed towards the outer circumference. There is no proper distinction of bark and W; increase of size takes place by pressure from the centre outwards, and the outer portions of the stem are always hardest and most compact. The principal representatives of endogenous woody stems are the palm-trees and the bamboos, but although these are largely used for structural and other applications of W., especially in the countries of their production, they are not to be compared for general utility with exogenous stems. The spurious stems of acrogens (tree ferns) have no place as sources of W. In an exogenous stem the W. is divided into an outer sap-W. or albumen portion and an inner heart-W. or duramen part. As a rule, it is only the heart-W. of a tree that is useful for the ordinary purposes of W., and the rate at which the sap-W. turns into heart-W. varies much in different species of tree. All kinds of W. are subject to many defects, which decrease their usefulness for building and other purposes. The principal defects are known as 'shakes'—a heart-shake consisting of clefts or fissures running through the centre of the W. across the pith; cup-shakes radiate from the centre or go round the lines of annual growth. Knots and warpings are also common defects, the former being especially characteristic of several kinds of pine-W. For trade purposes W. is classified under two heads, as soft W. and hard W., the leading representatives of the former being the numerous varieties of pine, and the latter embracing the oaks, beeches, ash, birch, and furniture-woods generally. Dye-woods form a class by themselves, and belong to a quite distinct trade. W., before it can be properly used for any structural purposes, must be seasoned by some means of drying, so as to withdraw the vegetable sap from it. The common and best way of seasoning is to stack the W. in the open air, but this process is tedious, especially with large logs and hard W. Submergence in water for some time hastens the seasoning operation, and steaming or boiling also render W. quickly fit for employment, although it weakens the timber. A process of desiccation in heated chambers is practised for the seasoning of thin planks and boards used by joiners and cabinetmakers, but such rapid seasoning is very ready to cause a splitting and warping of the W. Partly to season and partly also to increase the durability of W. in certain very exposed situations, various ways of treating timber with preserving agents are employed. One process, largely used for railway-sleepers and similar purposes, consists in impregnating the W. under strong pressure with creosote or impure carbolic acid. The process having been originally introduced and patented by the late John Bethell, is now known as Bethell's process. Bennett's process has also been extensively used, especially on the Continent. It consists in impregnating the W under pressure with the chloride of zinc (Burnett's fluid). Kyanising consists in treating the W. with Kyan's preserving fluid, a solution of the bichloride of mercury It is a process little used in England. Boucheri's process, which has been adopted to some extent in France, consists in causing the tree trunk to absorb a preservative solution—acetate of copper or acetate of iron—through its roots in the same way as it takes up and circulates sap while in life. The tree is felled and the root end is dipped in the proper solution, which then is carried through the trunk and supplants the ordinary sap. The process is not so well adapted for firs, oaks, ashes, and poplars as for such trees as the lime, beech, willow, alder, and elm There are several other preservative processes and solutions which have been brought forward but little used. Besides its multifarious applications as timber in engineering, shipbuilding, carpentry, and cabinetmaking, W. has numerous important minor uses. It is a most valuable fuel, and the source of W-tar, pyroligneous acid, W.-naphtha, and charcoal; and certain kinds of W are now extensively pulped for employment as papermaking materials.

Wood, Distilla'tion of. See DISTILLATION

Wood, Anthony, was born at Oxford, 17th December 1632, entered Merton College (1647), took his bachelor's degree (1652), and that of master (1655) His life was spent in laborious antiquarian research, illustrative of the history of his university. W died 29th November 1695. In 1674 appeared *Historia et Antiquitates Universitatis Oxoniensis* (2 vols. Lond 1674), a translation into Latin by Peers, a student of Christ Church, of W's English treatise on the subject. The first volume is devoted to the university, and the second to the particular colleges. Peers' version was so arbitrary and inexact that W. almost refused to own it. The English original, carefully edited by the Rev. John Gutch, was published at London (5 vols. 1786-96). Other works of W.'s are *Athenæ Oxonienses: An exact History of all the Writers and Bishops who have had their Education in the most Ancient and Famous University of Oxford from* 1500 *to* 1690, *with the Fasti or Annals of the said University* (2 vols. Lond 1691-92). A second edition of this by Tanner, with important additions, appeared in 1721, and a third, with continuation by the Rev. Philip Bliss, D.C L, Fellow of St John's College, Oxford (4 vols 1813-20) A fourth edition, projected by the Ecclesiastical History Society, only reached a first volume, containing, however, a *Life of W.* (1848) by Dr. Bliss. Though a man of mean capacity and narrow mind, W. possessed an inexhaustible industry, and accumulated vast stores of valuable knowledge See Mark Pattison's *Chapter of University History* in *Macmillan* (July-August 1875).

Wood, Sir Andrew, a famous Scottish admiral, was born about the middle of the 15th c., probably at the Old Kirkton of Largo in Fife. Originally a merchant trader of Leith, he learned the art of naval warfare by frequent encounters with pirates in defence of his ships and merchandise. James III. often employed him in honourable missions. In 1481 he defeated an English squadron in the Firth of Forth, and in the same year gallantly defended Dumbarton against the fleet of Edward IV.

His two ships, *The Flower* and *The Yellow Carvel* (each about 300 tons), made frequent voyages to the Dutch and Hanse towns, exchanging 'the wool and hides' of Scotland for 'the mercery and haberdashery ware' of the Continent. In 1482 he received as a reward of his services the honour of knighthood, and the lands and village of Largo in fee. W. was strongly opposed to the rebellion of the nobles against James III., kept close by in the Forth with his ships while the battle of Sauchieburn was going on, and for some time after the murder of the king refused to acknowledge the new government. In 1489, however, the appearance of a piratical English squadron in the Firth of Forth induced him, on the urgent solicitation of James IV., to place his services at the disposal of that monarch. He engaged the enemy off Dunbar, and captured every ship. On the 10th and 11th of August 1490, off the Isle of May, he won a brilliant victory over a skilful English commander, Stephen Bull, whom he carried with his three ships into the port of Dundee. Fresh honours and gifts of lands and superiorities followed these achievements. In 1503 W. was employed to chastise the rebels in the Hebrides. In 1511 he was put in temporary command of the *Great Michael*, built by James for the protection of Scotch commerce, and deemed the strongest ship then afloat. After Flodden he was sent to France to invite the Duke of Albany to accept the regency. His naval career was now over, but he was several times employed in court service. There is a story that he had a canal cut from his house in Largo down to the parish church, and that he used to sail thither in his barge every Sunday. He died about 1540. See the *Histories* of Pitscottie and Buchanan, and in modern times those of Tytler and Burton.

Wood'bine. See Honeysuckle.

Wood'bridge, a river-port of Suffolk, England, stands on the tidal Deben, 8 miles E.N.E. of Ipswich by rail. Its church of St. Mary, a fine Perpendicular flint-work structure, with a tower 180 feet high, was restored and enlarged in 1875; other edifices are St. John's (1845), the sessions-house (1587), a lecture-hall (1851), and the Seckford almshouses and grammar-school, two richly-endowed charities founded in 1587 and 1662, but amalgamated in 1861, when handsome new buildings were erected. In 1878 there entered the port 841 vessels of 48,286 tons, and cleared 804 of 47,866; the imports (coal and timber) amounting in 1877 to £21,464. Brick-making, ship-building, malting, and iron-founding are carried on, and W. publishes one weekly newspaper. Pop. (1871) 4403. Crabbe was apprenticed to a W. surgeon (1771); and at W., Bernard Barton, the 'Quaker poet,' lived and died (1806–49).

Wood'bury Pro'cess, a photo-mechanical printing process, in which an image obtained in relief on hardened gelatine by the agency of light is made by pressure to yield an intaglio impression on a lead plate, from which prints are thrown off in a press. This process, which gelatinised Indian ink, takes its name from Mr. Woodbury, the inventor, is extensively used for book illustration, being worked in London by the Woodbury Company, and—under the name *photoglyptie*—in Paris.

Wood-Carving. See Carving.

Wood Charcoal is the impure carbon obtained by the decomposition of vegetable matter by heat without free access of air. It may be produced from almost every kind of wood. Of British trees the beech, sycamore, ash, thorn, oak, birch, and alder are well adapted; the holly and yew, particularly the latter, make a very superior description; the elm, Spanish chestnut, and lime require to be peeled before charring; and there is an antipathy to the fir and other resinous trees. W. C. was formerly always made in a kiln in the open air. In this process the wood is cut into proper lengths and duly arranged in piles or stacks, it being of great importance to pack the wood close. The heap is then covered with turfs and the kiln lighted. Day and night the watch must be kept on the movements of the fire, until all the volatile constituents of the wood have been expelled, and the charcoal remains. Four to six tons of wood by this plan are required to produce one ton of good charcoal. But W. C. is now by preference made in large cylinders or retorts. By this process the charring takes place in about sixteen hours. The general properties of W. C. are, that it is black, sonorous, and brittle, and retains the form of the wood from which it is obtained; it is insoluble in water; infusible and fixed in the most intense heat; it is generally a bad conductor of heat, but conducts electricity; it absorbs various gaseous bodies, and has considerable antiseptic powers. The fumes given off by burning charcoal are poisonous. The charcoal made for medicinal purposes must be obtained from woods containing a small percentage only of mineral matter, such as willow. It is employed chiefly in the form of poultice to destroy the fœtor of sores and ulcers, also as a dentifrice, and is occasionally administered internally in dyspepsia. The important uses of W. C. are as a fuel and as an ingredient of gunpowder.

Wood'chat, or **Woodchat Shrike** (*Enneoctonus rufus*), a species of Shrike (q. v.) of rare occurrence in Britain, but common on the Continent. It is of a chestnut red on the head and neck, the back being black and white, relieved by brown tints. The under parts are white. The two central feathers of the tail are black, and the two outer feathers white. The eggs are a bluish white, speckled with dusky brown.

Wood'chuck (*Arctomys monax*), a species of Rodent animal allied to the Marmot (q. v.) and found in North America. Its average length is 16 inches, and its colour a blackish brown. It burrows in the ground, hence its familiar name of 'ground hog.' In winter it hybernates.

Wood'cock, a general name applied to different species of Wading Birds or *Grallatores*, allied to the *Snipes* (q. v.) or *Scolopacidæ*, and included in the *Longirostral* section of the waders—a group distinguished by having long bills grooved from the nostrils. The great toe is short, or may be absent altogether. The Common W. (*Scolopax rusticola*) has long been famed as a table delicacy. This bird attains a length of about 12 or 14 inches, and a weight of from 10 to 15 ounces. The general colour is a brown above, varied with darker tints, while the under parts are barred with dark brown. The tail is black tipped with grey. The W. is migratory, and arrives in Britain in March or April. In habits it is peculiar, appearing after mid-day, and feeding in early morning and at dusk. Its food consists of worms, for the capture of which its long bill is admirably adapted. The W. is wary and shy, and considerable experience is needed for its capture. The eggs are four, and are of a brownish-white colour blotched with brown. The mother W. is said to carry her young to the feeding-grounds. Large numbers are trapped by cleverly arranged nooses. The American W. (*S. minor*) is rather smaller than its British neighbour, attaining a length of 11 inches. It occurs almost universally throughout N. America.

Wood'-Engraving, or **Xylog'raphy**, is the art of producing designs on wood having lines or parts in relief, of which impressions may be obtained in an ordinary printing-press. A W.-E. or *woodcut*, which has its *whites* scooped out or cut away, and its *darks* standing in relief, is the reverse of a copper or steel plate engraving, in which the *darks* are represented by incisions or corroded parts, and the *whites* by the untouched surface of the plate. To obtain a print of a copperplate engraving involves a tedious process of inking and a special press (see Engraving), but a woodcut may be wedged in a chase with type, and an impression of both procured at the same moment. Woodcuts are therefore extensively employed for illustrating books and periodicals; and but for the invention and cultivation of W.-E. our vast illustrated literature—a salient feature of nineteenth-century civilisation, and a most important educational agent—which was pioneered by the *Penny Magazine* (1832) and the *Illustrated London News* (1842), could not have been possible.

The principle of W.-E.—that of taking impressions from inked wood blocks—was well known in Europe during the 13th and 14th centuries, and was applied in the attestation of documents by impressing monograms or cyphers thereon, and in stamping coloured designs on smooth surfaces, as of silk. The origin of W.-E. has been ascribed to the Chinese; but while it is indisputable that the latter produced printed books by means of engraved wood blocks at a period long anterior to the application of the principle by Europeans, it is believed that the latter did not acquire their knowledge from the East, but independently invented the art. The origin of printing is intimately associated with the invention of W.-E. in Europe. Early in the 15th c. the wood-engraver's art was applied in Germany to the production of images of saints, called *Helgen* or *Helglein*, a corruption of *Heiligen*, and playing-cards. The outlines only of the figures were carved on wood, and the prints on paper were afterwards

coloured by hand or stencil. The earliest known dated print is that of St. Christopher (the 'Christ-bearer'), which was discovered, pasted to the cover of a MS., in a convent at Buxheim, near Memmingen, in Suabia, and which is now in the possession of Earl Spencer. It bears the date 1423, admittedly genuine, and represents the saint traversing an arm of the sea and carrying the infant Saviour. The print is rudely executed, but internal evidence is afforded that it was not the first of its kind. The next step in advance was the cutting of pictures with explanatory texts on the same block, and a connected series of prints of these blocks form what is known to bibliographers as 'block-books.' The prints were obtained by rubbing a burnisher over the paper laid on the engraved block. Entire pages of text alone were then cut on blocks, and eventually the art culminated in the invention of movable types and taking impressions therefrom by means of a press (see PRINTING). Woodcuts were universally employed to illustrate books printed from movable type, and a Psalter printed on vellum by Faust and Schöffer at Mainz in 1457 is a famous example of the early combination of typography and W.-E., the large initial letters, beautifully ornamented, being printed in two colours. Caxton's second edition of the *Game and Playe of Chesse* (published in 1476) is the earliest specimen of an illustrated book in the English language. Towards the close of the 15th c. and early part of the 16th c. the art of W.-E. was brought to a high pitch of excellence by German masters, including Albert Dürer (q. v.), Hans Burgmair, Hans Schaufelein, Lucas Cranach, Lucas van Leyden, and Hans Sebald Beham. Dürer's illustrations of the *Apocalypse*, the *History of the Virgin*, *Christ's Passion*, and other works, are marked by beautiful and accurate drawing, a refinement of *cross-hatching* (an expedient introduced about 1486 of representing shadows and varied tints by intersecting lines), and wonderful pictorial effects. Under the patronage of Maximilian I. several works were issued illustrated with magnificent woodcuts executed by Burgmair, Schaufelein, and Dürer; and in 1538 there was published at Lyon, Hans Holbein's *Dance of Death*, illustrated with small pictures displaying remarkable skill in execution. *Chiaroscuro*, or the imitation of artist's drawing by printing in sepia, Indian ink, or other colours from several engraved blocks, was practised at this period, having been first introduced by Lucas Cranach. About the close of the 16th c. the art of W. E. began to decline in Germany, and in the succeeding century it also lost its artistic character in Italy, France, and the Low Countries, where it had been cultivated with considerable success. It was reserved for the father of English W.-E., Thomas Bewick (q. v.), to revive the neglected art, and to give it that vigorous impulse which has carried it to the high position it now occupies. Bewick introduced new resources into the art, and applied them with graceful and graphic effect in illustrating his works, the best of which are his *British Quadrupeds* (1790) and *British Birds* (1804). Of other English wood engravers who contributed to raise the art to its present state of perfection may be mentioned Nesbit, Clennel, Harvey, Branstone, Thomson, and Jackson.

Boxwood is, from its density and tenacity, the only wood suitable for W.-E. For common work pear and sycamore are in favour, and recently a process patented in 1876 for hardening wood so as to rival boxwood has met with some consideration. The boxwood is cut across the grain in slices of a thickness exactly equal to the height of type with which it, or a facsimile in metal, is wedged in printing. The slices are of small size, and for large 'blocks' several pieces are joined together by screw-bolts. After the drawing has been made on the block, the component parts may be distributed among several engravers for rapidity of working, and in such a case the parts when brought together again are touched up by one hand. The wood is coated with a preparation of Chinese white for the artist, who draws his subject thereon in pencil and washes of Indian ink. The engraver then proceeds to give expression to the artist's drawing by means of tools which mainly consist of angular-edged *gravers* and *tint-tools* of several sizes, adapted for rendering a great variety of tints, clouding, cross-hatching, graduated distances, &c., and *gouges* for cutting out intervals. Proofs of the work in progress are taken by hand with the aid of a *burnisher*. Stereotypy and electrotypy are taken advantage of in procuring duplicates of woodcuts, and photography has been utilised in transferring pictures to the block ready for engraving. Mr. A. E. Smith of London has recently perfected a photographic process of wide adaptation, called the *cryptotype*, which entirely dispenses with drawing. Wood-blocks are combined with metal plates and lithographic stones in the production of colour-prints, such as are issued by the *Illustrated London News*. Several substitutes for W.-E. have from time to time been proposed. The *Graphotype* (q. v.) has met with some measure of success for common work; and engravings, pen-and-ink drawings, &c., are now extensively reproduced in the form of surface-blocks to be set up with type, by means of photo-typography—a development of Pretsch's swollen gelatine process (see PHOTOGRAPHIC ENGRAVING).

Wood' Louse (*Oniscus*), a well-known genus of *Isopodous* Crustaceans (see ISOPODA), the species of which are commonly known as 'Slaters,' and are found beneath stones, the bark of trees, &c. The legs number seven pairs, and are attached to the thoracic segments. The segments of the abdomen are coalescent, and form a broad caudal shield. The W. L. is of a leaden colour. Allied genera and species are the Sea W. or Sea Slater (*Ligia oceanica*), and the *Porcellis scaber* is another species to which the name is often applied.

Wood'pecker (*Picus*), a genus of birds representing the family *Picidæ*, or that of the W. and Wryneck (q. v.). In these birds the tongue is extensile, and is provided with barbs and with a viscid secretion perfectly adapting it for the capture of insects. The bill is strong and wedge-shaped, and the claws are hooked. The feathers of the tail are pointed and stiff, and aid these birds in climbing and in fixing themselves on the trunks of trees. The toes are directed two forwards and two backwards, as in other *Scansorial* or climbing birds. The W. inhabits both hemispheres. Five species are British in their distribution. The Great Spotted W. (*Picus major*) attains a length of 9 inches. Its plumage is black and white, the top of the head being scarlet and the under parts white. The female wants the red hue on the head. The Green W. (*P. viridis*) attains a length of 10 or 12 inches. It is dark green above, tinted with yellow; the tail is black, and the under parts are ashen green. The head bears a scarlet crown. The other British species are the Great Black W. (*Drycopus martius*), the Northern three-toed W. (*Picoides tridactylus*), and the Lesser Spotted W. (*Picus minor*). Of American woodpeckers the Downy W. (*Picus pubescens*) is a familiar example. It is of a scarlet colour on the back, velvet black on the head, with a white streak over the eye. The under parts are white. The average length of this bird is 7 inches; its popular name of 'Downy W.' being derived from the loose feathers in the middle of the back. The Ivory-billed W. (*Campepholus principalis*) also inhabits N. America, and is so named from the extremely long ivory-like beak with which it is provided. It attains a length of 20 inches, and is of a black colour, tinted with a metallic green. A scarlet crest is borne on the black head, and the neck is marked with white. The bill is of an ivory hue, and may measure fully an inch in breadth at its base. The Red-headed W. (*Melanerpes erythocephalus*) of America is one of the best-known birds of the New World. It measures from 8 to 10 inches, and it is of a black colour, with a scarlet head and neck; the upper tail-coverts and under parts are white. The beak is blue, and the legs and feet greenish. Of the Ground W. the best-known species is the Gold-winged W. (*Colaptes auratus*) of America. This species destroys enormous numbers of ants of all kinds. Its length is about 12 inches, and its colour is grey and amber above, the throat reddish, and the abdomen yellowish, spotted with black. The inner aspects of wings and tail are a golden yellow.

Wood Oil, an oleo-resinous liquid obtained from several trees of the genus *Dipterocarpus*, growing in Eastern Bengal, Chittagong, Pegu, and some of the islands of the Indian Archipelago. It is extracted by making deep incisions in the trunk and laying fire therein. Some trees yield from 30 to 40 gallons in one season. W. O., or *Gurjun balsam* as it is also called, resembles copaiba balsam in medicinal properties, and in India is substituted for it. The Malays use W. O. as a varnish, and apply it instead of tar to seams of boats, &c., and to timber to preserve it from the ravages of the white ant. The W. O. of China is an entirely different substance from the foregoing, and consists of a fatty oil expressed from the seeds of *Aleurites cordata*. This oil is also used for varnishing and preserving wood, for mixing with pigments, and in medicine.

Wood'ruff (*Asperula odorata*) is a perennial herb, allied to the Bedstraw (q. v.), of wide distribution, entering into the flora of most countries of Europe, the Mediterranean region and W. Asia, and is a common plant of shaded hedge-banks, copses, &c., in the British Isles. It does not possess any economic value, but is notable for possessing the agreeable fragrance of cumarin during and after drying (see VERNAL GRASS). The genus *Asperula* numbers about 50 species, natives of temperate regions throughout the world. The root of *A. tinctoria* has been used as a substitute for madder, and *A. cynanchica* bears the name of 'Squinancy-wort' from its supposed efficacy in curing the quinsy.

Woods, For'ests, and Land Rev'enues, Commis'sioners of. Act 10 Geo. IV. cap. 50 consolidates previous Acts relating to the management of the Crown lands. They are placed under the management of the Commissioners of Woods and Forests, who are under control of the Treasury. Act 2 and 3 Will. IV. cap. 112 empowers the Treasury to transfer to the C. of W. and F. the management of the Crown lands of Scotland. The alterations made by 29 and 30 Vict. cap. 62 relate to points of detail. The yearly receipts amount to about £320,000. See CIVIL LIST, CROWN LANDS.

Wood Sorr'el. See OXALIDACEÆ.

Wood'stock, a market-town of Oxfordshire, on the Glyme, 7 miles N.N.W. of Oxford by rail, has a chapel mostly rebuilt in 1785, but retaining fragments of 12th c. work. The glory of the place is Blenheim Palace, in whose park, laid out by Capability Brown, the tiny Glyme is spanned by a mighty bridge, then widens into an artificial lake, while the trees are ranged as were the troops at Marlborough's victory. The palace itself, designed by Vanbrugh, covers 7 acres, and is a heavy, imposing pile, with rich art-collections, though its 'Titian Gallery' was destroyed by fire in 1861. Glove-sewing is the leading industry of W., which returns one member to Parliament, the pop. of the borough being (1871) 7477. The legends of Fair Rosamond's labyrinth and murder by Queen Eleanor, of Ælfred's and Chaucer's residence at W., must be abandoned; but as a royal manor from immemorial times W. has played its part in history. Here Æthelred held a *gemót*, Malcolm and Rhys paid homage, Edward the Black Prince was born, and Elizabeth was kept in ward by Mary. Here, too, the 'just Devil' disturbed the Parliamentary commissioners, as told in Scott's romance, and Rochester made an edifying end. Lastly, in 1704 came the grant to the victor of Blenheim, and the ruthless demolition of the ancient manor-house. See Marshall's *History of W.* (Oxf. 1873).

Wood' Swallow (*Artamus sordidus*), a species of Dentirostral bird not allied to the Swallow (q. v.), but related to the Shrike (q. v.). It is an agile, active bird, with pointed wings and a square tail. The best-known specimen is the Sordid W. S. found in Australia. It is black above and white below, and attains a length of 3 or 4 inches. An allied species is the Cinerous W. S. (*A. cinereus*) of Tasmania, so named from its dusky hue. The former is notable for its habit of massing itself together in numbers on the branches of trees in a fashion reminding one of the swarming of bees.

Wool is a modified form of hair, its distinguishing characteristics being greater fineness of fibre, the individual fibres are more or less waved or curled, and generally colouring matter is absent and the W. is white, although grey, brown, and black colours are found among wools. Further, when examined under the microscope, W. is seen to be much more scaly or imbricated in structure than common hair, and on that peculiarity its property of felting—one of its most valuable qualities—depends. In chemical composition pure W. is similar to hair and other epidermic products, the following being the percentage of substances present: carbon, 50·65; hydrogen, 7·03; nitrogen, 17·71; oxygen and sulphur, 24·61. Unwashed or raw W., however, contains a large proportion of mineral matter, and a fatty substance termed suint (a compound of a fatty acid, with potash) which are soluble in, and can be removed by washing with cold water. The proportion of matter other than pure W. in unwashed W. may amount to as much as 75 to 80 per cent. of its total weight. W. is the most important and extensively used of all fibres next to cotton, and indeed the term may be held to embrace all animal fibres in use, except silk. Although most largely derived from the numerous varieties of sheep, W. is also obtained from the Alpaca (q. v.) and allied species found in S. America, from the camel, the mohair goat, and the Cashmere goat of the Himalayan plateaus, whence the W. for the famous Cashmere shawls is obtained (see PASHMINA). W. comes into commerce in two distinct forms (1) as fleece W., and (2) as skin W. The former is obtained by the annual shearing or clipping of sheep, which in the United Kingdom takes place about the end of May. The fleece yielded by a sheep may vary in weight according to breed and local circumstances from 4 or 5 lbs. up to 8 or 9 lbs. Each fleece is made up of several distinct qualities of W., but it is generally sent into the market as it is clipped, the work of assorting qualities being afterwards performed by staplers. Lamb's W. differs from the W. of full-grown sheep in being softer and more delicate to the touch. Skin or pulled W. is obtained from the skins of slaughtered sheep, or of animals which have died a natural death. It is inferior in lustre, strength, and elasticity to fleece W. Among the many methods of classifying W., an invariable distinction is established between short or carding W. and long or combing W. Carding wools, which besides being shorter in the staple, more waved or curled, and more strongly scaled or imbricated than combing varieties, are represented by the W. of the merino sheep (see MERINO), a peculiar breed originally confined to Spain, but in the 18th c. introduced into Germany, and now bred in the Australian colonies, the Cape of Good Hope, and certain parts of S. America. Combing wools or worsted wools, so called on account of the manner in which they are prepared and the use to which they are put, are in the trade separated into combing kinds and carpet and blanket kinds. Under these heads are embraced all the long, comparatively coarse and straight wools, as well as alpaca and mohair. The raw materials of the W. trade are now supplemented to no inconsiderable extent by 'shoddy' and 'mungo' (see SHODDY), obtained from woollen rags, and mixed with raw wools for spinning into certain classes of fabrics. The regions in which sheep are grown largely on account of their yield of W. are vast, wide-spread, and most varied as to climate, and consequently the W. markets draw supplies from many quarters. The annual consumption of W. is enormous, and has been roughly calculated to 2,233,500,000 lbs. The United Kingdom is the largest consumer of W., and in addition to the native supply, estimated at about 155,000,000 lbs. annually, enormous quantities are imported from Australia and New Zealand, from the Cape of Good Hope, the River Plate, and from India, and smaller quantities are obtained from numerous other sources. The increase of the W. trade from Australia especially, but also from the Cape and the River Plate, has been marvellously rapid. In 1831 less than 2,500,000 lbs. of W. came from Australia, and the amount from the Cape did not reach 50,000 lbs. The following table shows the weight in millions of lbs. of pure washed carding W. produced in these regions during recent years:—

	1860	1871	1873	1875	1877	1878
Australia . .	35	107¾	109½	136¾	159	150½
Cape	14¾	30¼	32½	35	34	32¾
River Plate .	15½	74½	83½	70½	77¾	72¼
	65¼	212½	225½	242¼	270¾	254¾

The following statement, compiled by the eminent W. brokers, J. L. Bowes and Brother, of Liverpool, shows in a most compendious form the movements and progress of the trade during recent years. The figures are given in millions of lbs. :—

	1855	1862	1869	1877	1878
Receipts of all kinds of Sheep's W. into England	97¾	168¾	255¼	406	395½
,, ,, Alpaca	1½	2¾	3¼	3½	3¾
,, ,, Mohair	2¾	3¼	4¾	8¼	7
,, ,, Rags (for shoddy) .	5¼	29¼	37½	75	72¼
Weight of W. grown in England	140	140	155	155	155
Total supply	247¼	344	[illegible]55¾	647¾	633½
Exported	45½	58¼	129	197	205½
Retained in England. .	201¾	285¾	326¾	450¾	428
Percentage retained	81⅝	83	71¾	69⅝	67½
,, exported	18⅜	17	28¼	30⅜	32½

The fluctuations in value of certain standard qualities of W.

since 1860 are shown in the subjoined statement. The figures represent pence per lb. :—

	1860	1863	1866	1869	1872	1875	1878
Port Philip washed (carding)	24	23	22¼	17	27	22½	19½
Lincoln Wether " (combing) . . .	21	24	21	15½	26	17	12¾
East India, best soft (carpet)	14	16	14½	11	17½	14	9½
Alpaca Islay fleece . .	27½	30½	38	28	30	30	17
Mohair Turkey fleece .	35½	36	44	45¾	40½	43	23

Wooll'en and Wor'sted Manufac'tures. The industries connected with wool are among the earliest, and they were at one time the most important, of English manufacturing industries; and indeed they continued to be the greatest of British textile manufactures till the enormous development of the cotton manufacture about the beginning of the 19th c. took place. The wools of England were in the Middle Ages accounted the best in Europe. The manufacture of woollen cloth is supposed to have been established in England during the Roman period, but there is no evidence to fortify this conjecture. At the time of the Norman Conquest, Flemish weavers came to England, but the first effective impetus to the industry was given in the reign of Edward III., when seventy families of clothworkers from the Low Countries settled in England. At that period the worsted manufacture was already established in Norwich, and whether the name of the manufacturing town, Worsted, in that county, is derived from the industry, or the trade named after the town, is a point not quite settled, although the former is the more probable theory. Many curious legislative measures were from time to time passed with the view of fostering W. and W. M., and some of these Acts of Parliament remained unrepealed till this century, a law prohibiting the export of English wool only having been repealed in 1824. The dyeing, spinning, and weaving of woollen fabrics was a domestic industry spread throughout the entire country till almost within the memory of persons now (1879) living; but for a long period special departments of manufacture have been gravitating towards the well-recognised centres in which they are now established as great factory industries.

Woollen manufactures include the preparation of all kinds of cloth made with short wool, the yarn from which is prepared by carding, and the cloth is always close in texture, and partially felted in finishing. Broad cloths, doeskins, Meltons, beavers, diagonals, Venetians, and tweeds, are all examples of woollen manufactures. *Worsted* manufactures have to do with long-staple wools, prepared for yarn-spinning by a process termed combing, and woven into hard-spun lustrous textures used for ladies' wearing known as 'Bradford goods,' such as lustres, cords, moreens, camlets, &c., and reps, merinoes, worsted damasks for hangings, and numerous other more or less fanciful and fleeting classes. Carpets and blankets are also examples of worsted fabrics, although these are regarded as distinct branches of trade, and so also are the worsted hosiery and knitting worsted trades. Felting is avoided in all the branches of the worsted manufacture. The classes of wools used for these distinct trades have already been indicated under WOOL (q. v.); but it may here be said that the wool of different portions of one fleece may be stapled out for use in both these departments of industry. The processes employed in the woollen manufacture will here be first indicated, and thereafter, so far as they differ, the stages in the worsted manufacture will be sketched.

In the preparation of woollen yarn the following are the essential processes, beginning with unsorted raw wool. 1st, stapling; 2d, scouring; 3d, drying; 4th, willowing; 5th, oiling; 6th, carding; 7th, condensing; and 8th, spinning. The object of the 1st process, *stapling*, is to arrange the whole of the wool into uniform qualities, each fleece, as already mentioned, yielding several different qualities as regards fineness and length. The work was formerly much carried on as a separate trade by staplers, but now many of the large manufacturers staple their own wool. *Scouring* is essential for removing suint and all extraneous matter which attaches even to well-washed wool. It is done in long tanks supplied with a constant flow of hot alkaline water, admitted pure and clean at the opposite end of the tank from that at which the wool is thrown in. The tank is fitted with a series of bars, on each of which a line of long spikes, which, moving through half a circle within the water, carry the wool gradually forward through the tank. In this way the dirty wool enters the water where it is dirtiest, and as it passes on gradually losing its impurities it meets water proportionately less impure, till at the end where it is removed from the tank the now well-washed wool is submitted to water just entering the tank, and consequently perfectly clean. From the tank it is passed between a pair of squeezing rollers, thereafter sometimes rinsed in pure water, and thrown in an open fleecy state on a drying machine, which consists of a sloping perforated copper cover placed over a series of hot pipes through which air is blown. The *willowing* or *devilling*, which follows this operation, has for its object the opening out of the wool to a uniform mass, and the removal of 'burrs' and any mechanical impurities which still remain in the wool. In some kinds of wool the presence of burrs or closely matted seeds, &c., is the cause of serious annoyance, and special burring machines must be used to free them from these entanglements. At this stage also wool intended for the manufacture of wool-dyed goods, as opposed to yarn-dyed or piece-dyed fabrics, is dyed. It is only, however, the fastest and most enduring dyes that can be used, as inferior colours would be injured by the 'milling,' and other operations through which cloth passes ere it is finished. Consequently it is only the finest and most valuable cloths that are wool-dyed. Wool after scouring has lost all its natural oil, and in that way becomes harsh, dry, and brittle. It therefore is necessary before submitting it to the carding and subsequent operations to give it some amount of freedom and suppleness, and that is done by *oiling* the fibre. For the finer wools olive oil or earth-nut (*Arachis hypogæa*) oil is used; but fish oil, rape, cotton-seed, and lard oil, &c., are also largely used. The *carding* which follows is an operation for which generally two carding engines or machines are used; 1st, the scribbling card or scribbler, and, 2d, the finishing card or finisher. The carding machines consist of a series of revolving rollers or cylinders covered with leather or vulcanised india-rubber studded with innumerable teeth of bent steel wire. These cylinders revolve in different directions, and as the one carries the material operated on from the other, the fibres are disentangled and pulled out so that they form a long uniform continuous sheet or film. From the second carding engine the thin sheet, ingeniously divided up into uniform strips, passes to the condenser, on which the strips, by passing through a smooth ring and by the action of a series of small rollers, are gradually rolled or *condensed* into a round, soft, untwisted cylindrical cord or sliver technically called a 'slubbing.' Each sliver as it is delivered from the condenser is wound on a large bobbin or spool, and in this form it is ready for spinning on the self-acting mule. In the *spinning* of woollen yarn, the point of distinguishing importance is to produce yarn as soft, woolly, and open in texture as possible, so that in finishing a nap or pile may be easily raised on its surface. The yarn is therefore only lightly spun, and it has no great cohesion. The operation of spinning is one of great nicety, and demands the most perfect and delicate machinery. In a single mule as many as 200 separate bobbins of slubbing are being spun into perfectly level, equal, and uniform yarn at the same instant, and the action of the machine draws out the slivers to the requisite degree of attenuation, and in drawing them gives that amount of twist necessary to keep the slivers from breaking, but not too much to prevent their further drawing out. Finally, the spinning mule has to give the same amount of twist to the yarn throughout, and to wind the spun yarn on the mule cops. The complexity of the machinery and adjustments used in the spinning, and indeed in all the other processes alluded to, is such as renders it impossible to attempt to convey any intelligible idea of their action within any moderate compass. The *weaving* of woollen cloth is attended with some difficulty on account of the soft and ill-compacted condition in which the yarn is purposely left, and the goods as taken from the loom present a rough and uneven appearance. After being taken out of the loom the cloth is washed to free it from oil, weaver's dressing, and other impurities which may have attached to it. The washing is done in a mixture of urine, dung, blood, and salt, and afterwards in soap-and-water. Next in the *fulling* stocks the cloth is subjected to a beating from the heavy hammer of the apparatus while abundantly supplied with soap-and-water. A further felting is communicated in the *milling machine*, in which the cloth is

further treated with a soapy solution and subjected to pressure. At this stage the cloth should have become thick, uniform, and leathery in appearance. It is again washed and stretched or *tented* equally in every direction, and while so extended it is dried either slowly or by the application of heated air. The nap or pile is now raised by passing the cloth in every direction over a frame filled with teazles, the thistle-like flower-heads of a plant *Dipsacus fullonum*. The teazles have strong elastic recurved spines which entangle themselves in the woolly surface and so raise from the now well-felted mass a velvety pile. Afterwards the pile is cut to a uniform length by a shearing machine; it is laid or made to slope in one direction by a dressing machine, after which it is hot pressed. *Lustering* or *decatting* finishes the numerous processes. It consists of wrapping the fabric smoothly and tightly on an iron cylinder and subjecting it to several immersions for a period of six or eight hours at a time in water heated to about 185° F. Finally the cloth is dried, pressed, and folded into pieces.

Worsted yarn is, as already indicated, made from long-staple wool which undergoes a combing process designed to stretch the fibres and lay them parallel to each other. The wool, in a damp state in order to prevent the tendency of the material to curl, is first fed into a series of 'preparing gill-boxes' provided with steel combs (gills) which separate and straighten the fibres. The gills of each succeeding box have finer and closer teeth than those immediately preceding, and from the last box the wool is delivered in the form of a continuous sliver. Twenty such slivers are placed together and introduced into the combing-machine, known to the trade as 'Lister's Nipping Machine.' This machine, which was patented in 1851 by Mr. S. C. Lister of Bradford, is a triumph of mechanical art, and to it is due in a great measure the extraordinary, rapid, and substantial development of the English worsted industry. It has entirely superseded the former manual operation of combing, which was not only laborious but much less productive and efficient than machine-combing. In the combing-machine the wool is fed between a pair of rollers into a series of 'screw-gills,' through which it is drawn in detached tufts by nipping jaws. The tufts are then carried by a 'porter comb' and deposited on a large circular rotating comb, and through its teeth they are drawn by a roller arrangement and delivered as a continuous sliver, called *top*. The fibres are thus laid parallel to each other, and all short portions of wool, technically termed *noils*, not fitted for making worsted yarn are separated. The top is then passed through 'finishing gill-boxes,' which condense it and prepare it for the drawing-frame. This machine consists of several pairs of rollers, and between them the sliver is repeatedly drawn with the object of uniformly extending it. Roving follows and still further attenuates the sliver, which is now ready for being spun into yarn in the throstle-frame, provided with spindles and flyers for long wool, and spindles and caps for short wool. Some varieties of worsted goods are composed of short fibres, which cannot be combed in the Lister machine, and for which an ingenious machine, invented and patented in 1853 by Mr. Noble, is employed. Before being fed into the Noble machine the fibres are carded in a carding-engine adapted for the worsted trade, and the oil imparted to them in the process is removed by washing. Worsted yarn is put up in hanks or skeins of 560 yards, and its relative tenuity is indicated by a number which gives the count per pound. Thus, '36s' yarn signifies that in 1 lb. there are 36 hanks of 560 yards each, '24s' yarn gives 24 hanks to the lb., and so on.

In the year 1871, when the wool industry was approaching its zenith in the United Kingdom, there were then in all 1829 woollen factories, having 2,727,017 spindles and 50,826 power-looms, giving employment to 64,039 males and 63,897 females, in all 127,936 persons. In the worsted trade there were 630 mills, 2,131,452 spindles, 64,454 power-looms, and the persons employed numbered 126,589, of whom 49,004 were males and 77,585 females. The following is a statement of the value of the exports of W. and W. M. during the past three years, and the figures, it will be seen, indicate that the trade during that period has been seriously declining, but more in value than in actual amount.

	1878.	1877.	1876.
Woollen Cloth, Coatings, &c. . .	£6,264,023	£6,599,717	£6,541,410
Worsted Stuffs	7,438,719	7,680,571	[illegible],141,605
Carpets	840,077	847,464	911,873
Other Articles	2,180,190	2,106,944	2,098,590

The woollen manufacture of the United States rose from $4,413,068 in 1820 to $217,668,826 in 1870, and in 1876 was estimated at $208,118,875; while the import of manufactured wool has steadily decreased from 70,896,713 in the year ending June 30, 1873, to $33,087,062 in that ending June 30, 1878. As the imports are reckoned at gold value, and without duty, their value is about double the sum stated, so that over two-thirds of the woollens in the United States markets is of native manufacture. The growth of the manufacture has increased the production of raw wool to 207 million lbs. in 1878 (in 1876, 195 million lbs., against 44,642,836 lbs. imported). The chief seats of the W. M. in the United States are Pennsylvania, New York, Connecticut, and Rhode Island, though most of the States have some manufactures of this kind.

Wooll'ett, William, an English engraver, was born at Maidstone, 27th August 1735. After an apprenticeship to John Tinney, an obscure London engraver, he adopted a style of his own, combining in a single plate the use of aquafortis, the burin, and the dry needle. His landscapes procured him a high reputation, and are remarkable for their realistic treatment of rocks, water, and foliage. Nine English landscapes after Richard Wilson have still a high artistic value. Other notable works are the engravings of Benjamin West's 'Death of Wolfe' and 'The Battle of La Hogue.' W. was long engraver to George III., and after his death, which took place in London, 23d May 1785, a monument was erected to him in Westminster Abbey.

Wool'ner, Thomas, R.A., an eminent English sculptor, was born at Hadleigh, in Suffolk, 17th December 1825 and educated in Ipswich. At the age of thirteen he entered the studio of William Behnes, under whom he worked for six years and became a skilful draughtsman. W.'s first efforts showed a fine imagination and a cultured intellect. He drew his inspiration from the high sources of poetry and history. In 1843 he exhibited at the Royal Academy 'Eleanor Sucking the Poison from Prince Edward's Wound,' and about the same time a life-size group, 'The Death of Boadicea,' the latter of which was hailed as the promise of a great career in ideal sculpture. These works were followed by figures of 'Puck,' 'Titania with her Indian Boy,' 'Eros and Euphrosyne', and 'The Rainbow' (1848). In 1850 he joined Millais, Holman Hunt, and D. G. Rossetti in establishing the Pre-Raphaelite magazine called *The Germ*, to which he contributed some poems which were afterwards gathered, with additions, into a volume entitled *My Beautiful Lady* (1863; 3d ed. 1866). In 1854 he visited Australia, where he remained for two years, and executed some fine medallions. On his return to England he produced a life-size statue of Lord Bacon for the new museum at Oxford. Among W.'s subsequent works may be mentioned his statues of Prince Albert for Oxford, Lord Macaulay for Trinity College, Cambridge, William III. for the Houses of Parliament, Sir Bartle Frere for Bombay, Dr. Whewell for Cambridge, Lord Lawrence for Calcutta, Lord Palmerston for Palace Yard; busts of Tennyson, Carlyle, Newman, Darwin, Cobden, Dickens, Kingsley, Gladstone, Lushington (University of Glasgow), Huxley, and other distinguished men. But he has not abandoned his early idealism. He is still the first of England's poets in marble. 'Elaine with the Shield of Sir Lancelot,' 'Ophelia,' 'Guinevere,' and 'Achilles and Pallas Shouting from the Trenches' (1876), show the same high aim as the earlier products of his chisel. In 1878 W. completed a colossal statue in bronze of Captain Cook for the Government of New S. Wales, which has been erected in Sydney. In 1874 he was elected an R.A., and in 1877 was appointed Professor of Sculpture in the Royal Academy.

Wool'sack, a large cushion of wool covered with red cloth forming the seat of the Lord Chancellor of England in the House of Lords. It was first introduced in the reign of Queen Elizabeth to commemorate an Act forbidding the exportation of wool, then the staple industry of the country. The term is often used colloquially to designate the office of Lord Chancellor.

Wool'sey, Theodore Dwight, D.D., LL.D., born in New York, 31st October 1801, graduated in 1820 at Yale College, where, after studying theology at Princeton, he was a tutor (1823–25). Licensed to preach in the latter year, he studied Greek in Germany (1827–30), became Greek professor at Yale College (1831), and was its president (1847–71). He still (1879) resides at Newhaven, lecturing occasionally in the law school,

and often preaching in the college chapel. A master of political science, a brilliant scholar, and a profound and catholic theologian, W. has edited four Greek plays (1833-37) and Plato's *Gorgias* (1842), and has published many sermons and discourses; but his fame is principally based on his *Introduction to the Study of International Law* (1860; 5th ed. 1879) and *Political Science, or the State Theoretically and Practically Considered* (1878). He has also written *An Essay on Divorce and Divorce Legislation* (1869), in 1874 re-edited Prof. Lieber's *Civil Liberty and Self-Government* and *Manual of Political Ethics*, and is now chairman of the American branch of the committee for the revision of the New Testament.

Wool'ston, Thomas, one of the English 'deistical' writers, was born at Northampton, 1669, studied at Sidney Sussex College, Cambridge, where he obtained a fellowship (from which he was afterwards removed), entered the Church, and spent his life in polemical warfare. He was finally fined £100 and sentenced to a year's imprisonment for the 'blasphemous' nature of his *Discourses;* and as he refused to make submission to the powers temporal and spiritual, he lay in prison till his death, 27th January 1731. W.'s chief writings are *The Old Apology for the Truth of the Christian Religion against the Jews and Gentiles Revived* (1705), *Moderator between an Infidel and an Apostate* (1725), *Discourses on the Miracles of our Saviour* (1727-30). This last work excited a profound sensation. It was answered by Lardner, Pearce, Sherlock, Smalbroke, Stevenson, and many others. Its general argument was simply this: the miracles in the Bible are incredible as they stand; those who wrote the evangelical narratives never meant that they should be taken literally; to do so amounts to blasphemy; they are *allegories*, and it is only when looked at in this light that we catch their true meaning. W. was a man of learning and ability, but the many strange vagaries of his life and in his writings force us to the conclusion that he was partially insane. See his *Life, with an Impartial Account of his Writings* (1733); also Lechler's *Geschichte des Englischen Deismus* (Stuttg. 1841), and Leslie Stephen's *History of English Thought in the 18th C.* (2 vols. Lond. 1876).

Wool'wich, a town of Kent on the southern bank of the Thames, 10¾ miles E. of London by rail. The garrison where every artillery officer or recruit must learn his art, it has few buildings of interest beyond such military establishments as the Artillery, Marine, and Sappers and Miners' Barracks, the Ordnance Hospital, the Rotunda or military museum, a Soldiers' Home (1876), and on the western slope of Shooter's Hill the Herbert Military Hospital (1865) for 700 patients. The Royal Military Academy (q. v.), partly destroyed by fire in 1873, has been restored, and since 1876 £20,000 has been expended in increasing its accommodation. From W. Dockyard, with a river frontage of 3680 feet, was launched the *Henrye Grace de Dieu* (1512), but it was closed in 1869, and three years later handed over to the military department. The famous Arsenal, however, transferred from Moorfields to the E. of W. about 1720, was never so busy as now. Four miles in circumference, it is divided into the carriage, gun factory, laboratory, saddlery, and ordnance departments. The first supplies every species of carriage, slide, and platform for naval and military guns of the heaviest calibre, besides sponges, rammers, military waggons, ammunition carts, boat pontoons, &c. Its expenditure in 1876-77 was £72,826 on materials and £70,531 in wages, exclusive of £11,992 for alterations and repairs. During 1873-76 the gun factory turned out no fewer than 2422 heavy guns, among them the famous 80-ton (1875-76), which, with a charge of 425 lbs. powder, possesses a striking force of 30,168 foot-tons. In 1876-77, 542 pieces of ordnance were produced, viz. 44 38-tons, 5 25-tons, 14 18-tons, 217 64-pounders, &c. The cost of materials was £172,664, wages amounting to £58,917, indirect expenditure to £26,127. There were further 522 guns and howitzers sighted and completed after proof, and many appliances manufactured, at a cost of £12,470; and £23,722 more was spent upon miscellaneous services. The laboratory in 1876-77 produced 65,773,930 cartridges for small-arms, and for heavy guns and other ordnance 211,064, besides 87,282 fuzes, 10,637 rockets, 231,578 shells, 222,139 heavy shot, &c., at a cost for materials of £210,280, for wages of £176,053. The saddlery department made 1596 saddles and 3322 saddle-trees; and lastly, the ordnance department comprises a gigantic armoury. W. publishes three weekly papers, and had a pop. (1871) of 35,557, including 4110 military.

Woonsock'et, a township in Rhode Island, U.S., on the Blackstone River, 37 miles S.W. of Boston by rail. It consists of a cluster of villages, which have become, from the great available water-power, active seats of manufacture. It has 9 churches, a high school, and 8 other schools, the Harris Institute with a free library of 7000 vols., 2 daily, a bi-weekly, and 2 weekly newspapers. The principal manufactures, in the production of which $6,000,000 of the $10,000,000 town valuation are invested, are woollens, cottons, india-rubber articles, machinery, and cast-iron fabrics. Pop. (1870) 11,527.

Woo'rali Poison, now generally called *curara*, obtained from the *Strychnos toxifera*, is used by the S. American Indians as an arrow poison. An alcoholic extract, called curara or Curarin (q. v.), is obtained from the crude W., which is in commerce a black-brown resinous mass, soluble in water, but slightly so in alcohol. The alcoholic extract, obtained by Roulin and Boussingault in 1828, was a solid transparent mass, of an excessively bitter taste, and possessed all the virulence of the W. P. The W. P. contains no strychnine, but belongs to the narcotic rather than to the tetanic poisons. It is extremely virulent and rapid in its action, so much so that a large animal may be killed by a poisoned arrow in five minutes, and it may retain all its properties for an indefinite length of time if kept dry.

The physiological properties of the W. P. have been investigated by numerous experimenters, such as Virchow, Münter, Bernard, Pelouze, Vulpian, and Kölliker, the last arriving at the following conclusions in 1857:—(1) That the W. P. causes death very rapidly when injected into the blood, or inserted into a wound; and that when introduced by way of the mucous membrane, its effects are slow, and require a large dose for their production; when applied to the skin of frogs it is inoperative. (2) It acts through the blood, and destroys the excitability of the motor nerves, while the sensory nerves are hardly at all affected. (3) When artificial respiration is carried on in animals under its influence, many of the secretions are increased owing to the paralysis of the vascular nerves, and the consequent dilatation of the vessels. (4) That in mammals the poison causes death by the paralysis of the respiratory nerves and suppression of the respiration, which brings on convulsions as a collateral effect.

There are two varieties, called Corroval and Vao, whose properties have been investigated by Weir, Mitchell, and Hammond. From a large number of experiments on living birds, mice, cats, frogs, and alligators, they find (1) That corroval differs essentially from any variety of W. hitherto described in its physiological results. (2) That it acts primarily on the heart through the medium of the blood, producing an arrest of the heart's action. (3) That the annihilation of voluntary and reflex motion is a secondary result of its action, depending primarily on the cessation of the heart's action. (4) That it acts upon the nerves from the surface to the centre, and abolishes both the sensory and the motor functions. (5) That it destroys muscular irritability. (6) That it paralyses the sympathetic nerve, this being one of its primary effects. (7) That it is absorbed both from the intestinal canal and skin of frogs; and (8) that its poisonous effects are due to an alkaloid hitherto undescribed. They consider that vao is only a weaker variety of corroval, and that it is quite distinct from the ordinary W.

W. or *curara* has been used in medicine in cases of hydrophobia and chorea; and discs, for use in hypodermic injection, have been prepared by Messrs Savory and Moore of London. See Hammond's *Physiological Memoirs* (1863).

Wootz, a kind of steel manufactured in India by melting malleable iron in crucibles in contact with carbon. This is the most ancient of all methods for preparing steel.

Worce'ster, a city of Worcestershire, England—and itself also a county—on the Severn, 22 miles S.W. of Birmingham by rail. It is a handsome town, mostly of red brick. The chief building is the Cathedral of St. Mary, built of red sandstone in the form of a double cross, and measuring 425 feet in length, 145 feet in width, and 193 in height. The predominant styles are Early English and Decorated. The cathedral, first erected (983), was rebuilt by Bishop Wulfstan (1084), and again (1281). Many alterations have since been made, and it has lately been elabo-

rately 'restored' at a cost of more than £100,000. It has a good tower, with a clock and carillon of twelve bells, and contains the tomb of King John and of Prince Arthur, eldest son of Henry VII. In September 1878, after an interval of six years, the 155th musical festival of the Three Choirs (of Worcester, Hereford, and Gloucester) was held in W. Cathedral. The other principal churches of W. are St. Helen's, St. Andrew's, St. Alban's, St. Martin's, all recently renovated; St. Nicholas's, entirely repaired in 1867; and Holy Trinity, erected in 1867. Other churches are St. Mary Magdalene (1876), and St. Margaret's Church (1874). Baptists, Methodists, Congregationalists, and Presbyterians have also several places of worship. W. has a guildhall, a grammar-school, hop-market, and elegant banks. A new fruit-market was opened in 1874. The theatre, destroyed by fire 24th November 1877, was rebuilt in 1878. Ruins of the castle and monastery of W. lie a short way S. of the cathedral. The grammar school and the cathedral school have a high reputation. Glove-making has long been the staple industry of W., and affords employment to over 5000 hands. The porcelain made here is also very famous for its delicacy and beauty of design. Iron-foundries have existed from time immemorial, and tanning and rope-making are carried on. Hops are extensively grown in the neighbourhood. The trade is chiefly in coal, corn, and malt. The town sends two members to Parliament. Pop. (1871) 38,116. W., which dates from prehistoric times, was successively a British fort, a Roman camp, an English stronghold, and a bishop's see (from 680). Destroyed by the Danes, it was rebuilt by Ethelred, sacked by Hardicanute (1041), and frequently by the Welsh during the following two centuries. Later on, civil commotions retarded its progress. A new charter was granted by James I. in 1622, and W. espoused the royal cause throughout the great rebellion; here Cromwell achieved his 'crowning mercy,' 3d September 1651. For its constant fidelity to the royal cause, W. received from Charles the motto still on the city arms, '*Civitas in bello et in pace fidelis*.' See the *Origin and Progress of the Meetings of the Three Choirs of Gloucester, W., and Hereford, and of the Charity connected with it*, by Rev. Daniel Lysons, M.A., F.R.S., F.S.A., continued by J. Amott, organist of Gloucester Cathedral, and E. Rimbault, LL.D.

Worce'ster, a city of Massachusetts, U.S., 60 miles W. of Boston by rail. It has 22 churches (10 Congregational, 7 Methodist, 5 Roman Catholic), a State normal school, and three academies, the library (70,000 volumes) of the American Antiquarian Society, a free public library (whose reference department was consulted by 22,833 persons in 1877, and which then had an endowment fund of $35,000), Institute of Industrial Science, hospital, lunatic asylum, large mechanics' hall, and 3 daily papers. There are 11 banks, 5 insurance companies, and 2 fine parks. By the census (1875) it appears that the district of W. has 136 boot and shoe factories, 44 clothing factories, 64 furniture-works, 95 lumber-works, 88 machinery-works, 63 woollen manufactories, 49 flour-mills, 44 clothing works, &c. There are also iron-works, paper-mills, &c. These employ upwards of 35,000 hands. Pop. (1876) 50,792. Settled in 1675, it suffered frequently from the Indians—especially Philip of Pokaoket—till 1713. Mr. Isaiah Thomas, who read here the Declaration of Independence, started the first printing-press and first paper here, 3d May 1775. W. has since grown rapidly, the valuation having increased from $22,599,850 in 1866 to $48,219,397 in 1876.

Worce'ster Coll'ege, Oxford, was founded in 1714, out of the older Gloucester Hall, by Sir Thomas Cookes of Bentley, Worcestershire, Bart., for a provost, six fellows, and six scholars. At present there are fourteen fellowships, sixteen scholarships (of about £75 for five years), and twelve exhibitions. Of the fellows four, of the scholars five, must be sons of clergymen, needing support at the universities, and six of the remaining scholarships are for scholars of Bromsgrove School. W. C. presents to ten livings, and in 1878 had 94 undergraduates, 213 members of Convocation, and 367 members on the books.

Worce'ster, Edward Somerset, Marquis of, one of the early inventors who utilised steam as a motive power, was born in 1601. As Earl of Glamorgan he was despatched to Ireland in 1645, on a secret mission, by Charles I., with the object of treating with the Catholics and raising troops for the king's service. The secret was discovered, however, and only the king's influence saved him from imprisonment. The next year he succeeded to his father's title, and in 1648 went to France as a voluntary exile. On his return in 1652 he was imprisoned in the Tower for three years, and thereafter he devoted himself wholly to the mechanical inventions which have procured him his fame. In 1663 he published a work entitled *A Century of Inventions*, in which he describes his ingenious devices for raising water through the agency of steam. W. died April 3, 1663. His *Century of Inventions*, with a commentary by Henry Dircks and a biography, was published at London in 1865.

Worce'ster, Florence of. See FLORENCE OF WORCESTER.

Worce'stershire, a midland county of England N. of Gloucester and E. of Hereford. Area, 472,453 acres; pop. (1871) 338,387. The surface is a broad undulating plain broken in the N.E. by hills of moderate elevation, and in the S.W. by the Malverns, the highest summits in the country. Red sandstone, lias, and oolites are the prevalent rocks. The soil is always excellent, and abundant water supply accessible. Scarcely 20,000 acres are yet waste. In 1878, 116,884 acres were under corn crops (62,488 wheat), 30,229 under green crops, 34,072 under clover, hay, &c., 195,294 under permanent pasture, 2474 under hops, 16,972 bare fallow. W. is famous for its pear orchards and its 'perry.' There were (1878) in the county 19,569 horses, 55,344 cattle, 215,921 sheep, 43,523 pigs. W. lies almost entirely in the basin of the Severn, which receives the Teme on its right and the Salwarp and Avon on its left. In the N. several important canals—chief among which is the Worcester and Birmingham—connect the Severn Basin with those of the Trent and Mersey. The mining of iron and coal forms a most important industry. The chief towns are Worcester, Kidderminster, Stourbridge, Droitwich, Evesham, and Upton. W. returns four members to Parliament, and the constituency numbers 18,166. The gross rental (1877) was £2,004,440, the poor rate (1878) £164,780, and the number of paupers (1878) 9636.

Worde, Wynkyn de, one of the earliest English printers, was a native of Lorraine. Whether he was with Caxton at Bruges is open to question, but he was certainly for many years in the famous office at Westminster, and succeeded to the business on his master's death. About 1500 he removed to the city, and from 1502 till his death in 1534 he had his office at the sign of the 'Sun' in Fleet Street. He was appointed king's printer, enjoyed the patronage of Margaret, the mother of Henry VII., and attained a good position as a citizen of London. Though less scholarly than Caxton, W. did excellent service to his art. He was his own typefounder, and not only did he set the fashion of employing Roman letters as we now use italics, but he was the first to introduce Greek types into England, and in some of his works he inserted Hebrew and Arabic characters cut in wood. Of the four hundred and odd books which proceeded from his press it is enough to mention *Bartholomæus de Propriatatibus Rerum* (without place or date, but about 1495), which was the first book printed on English paper, and ranks as altogether his finest production; *Scala Perfectionis* (1493), *Bonaventuras Speculum Vitæ Christi* (1494), Trevisa's *Polichronicon* (1495). See Blades, *Life of Caxton*; Bullen. *Caxton Celebration Catalogue* (Lond. 1877).

Words'worth, William, son of John W., attorney and agent for Lord Lonsdale, was born at Cockermouth, April 7, 1770. Left an orphan at the age of fourteen, after preliminary education in his native town he attended a school at Hawkshead in Lancashire. In his eighteenth year he proceeded to St. John's College, Cambridge; but an academical career was not what he sought or achieved. After a pedestrian tour on the Continent with a fellow-student named Jones, he took his degree in 1791. In the autumn of that year he again visited France, where, amid the revolutionary ferment, he involved himself with the Girondists, and circumstances which obliged his return to England alone saved him from the guillotine, as he himself confessed. In 1793 he published *Descriptive Sketches* and *An Evening Walk*. 'Seldom, if ever,' says Coleridge, 'was the emergence of an original poetic genius above the literary horizon more evidently announced.' This laudation must refer solely to the *Descriptive Sketches*, memorials of his first tour abroad. Notwithstanding counsel that he should enter the Church, he

projected a periodical to be called the *Philanthropist*, and was looking out for newspaper employment when a legacy of £900 was left to him by his friend Raisley Calvert. Probably no such sum ever before produced so rich a poetical return. 'Upon the interest of the £900,' W. writes, '£400 being laid out in annuity, with £200 deducted from the principal, £100 a legacy to my sister, and £100 more which the *Lyrical Ballads* brought me, my sister and I contrived to live seven years, nearly eight.' There also came to the poet and his sister about £1800 each, arrears due by Lord Lonsdale; and in fairly comfortable circumstances they established themselves at Racedown, in Dorsetshire. There W. wrote a play called *The Borderers* (published 1842), only to demonstrate his utter lack of dramatic power. There, also, he met Coleridge; and the resulting friendship led him to become Coleridge's neighbour at the village of Alfoxden, Somersetshire. In 1797 the pair made a pedestrian trip, the first fruits of which was *Lyrical Ballads* (1798). This collection, beginning with the Ancient Mariner and ending with the exquisite lines on Tintern Abbey, was mainly an experiment towards simplicity in poetical diction. But the public thought the greater part of the diction much too simple, and Cottle, the publisher, counted the volume a dead loss. In 1799 W. took up his abode at Grasmere after a sojourn in Germany, and in the following year appeared a second volume of *Lyrical Ballads*, accompanied by an essay on the principles of poetry. In 1802 W. married Mary Hutchinson of Penrith, in praise of whom, three years after marriage, he wrote the beautiful poem, 'She was a phantom of delight.' In 1813 he removed to Rydal Mount, Westmoreland, for which county Lord Lonsdale made him distributor of stamps. This office brought him £500 a year, and its duties were performed by deputy. Next year was published *The Excursion*, a long poem, diffuse in style, lacking plan, and altogether too much like a dissertation, yet abounding in more subtle descriptive and meditative poetry than English literature had yet seen. W.'s innovations in style, many of them ludicrous affectations, had exposed him to the merciless mockery of Jeffrey and other critics, and obscured the rare nobility of his thought. Even in the *Poems* published in 1807 these mannerisms were frequent. But such as remained in *The Excursion* scarcely blemished the greatness of the work; and its author had to be acknowledged master of a new and splendid school. In 1815 W. increased his reputation by the tale of *The White Doe of Rylstone*, but unfortunately the scoffers could make merry over his next production, *Peter Bell* (1819), wherein are described the virtues and travels of 'a solitary ass.' The foundation of a great reputation had been laid, however, and W.'s history up to 1839 is one of new editions and increasing triumph. In that year Oxford conferred on him the degree of D.C.L.; in 1842 he retired from his office in favour of his second son, with a pension of £300; and in 1843 he succeeded his friend Southey as laureate. He died 23d April 1850, St. George's Day, and the anniversary of Shakespeare's death. The autobiographical *Prelude*, written so long ago as 1805, was published posthumously in 1850. W. is among the first half-dozen English poets, and is the greatest since Milton. His early republican sentiments were inflamed by the wondrous spectacle of the French Revolution, not even the horrors of which abated the ardour of his enthusiasm. At last, however, the profligacy and irreligion of the Revolution, followed by the insolent despotism of Napoleon, hardened him into a Tory. As Scott turned in disgust from his own age to the illusions of romance, W. turned to the sanctities of Nature. His dreams of perfect human brotherhood were at an end, but his imagination sought ideal communion with the pure loveliness and solemn grandeur of the external universe. The school of poets reigning when W. appeared were blind to nature, or looked on it as a dull, dead painting. W. set himself to study an 'infinite variety of natural appearances that had been unnoticed by the poets of any age or country.' He recognised a soul in nature, and rendered homage to her personality; and it is as Nature's high priest that he stands alone among all other poets. In pure originality, *i.e.*, in absolute self-dependence of genius, he has no superior in any age, and no compeer in his own. Even Keats and Shelley with all their unique and splendid powers of imagination do not disdain to learn from him; but he learns from no one. His thoughts have a divine freshness and beauty, as if nature in some supremely gracious mood had whispered to his soul her inmost secrets, and gifted him with a novel magic in uttering them. Though not habitually melodious in his verse, there are poems and stanzas and lines of his which no English poet, not even Shelley or Coleridge, has surpassed. The Ode entitled *Intimations of Immortality from Recollections of Early Childhood* is a miracle of various music; and in its rich alternations of description, sentiment, and reflection, from the radiant and gleeful opening to the profoundly tender and pensive close, marks the highest reach of poetic inspiration in the 19th c. W.'s serene life was in harmony with his noble teaching, and even his two great faults reflect on his contemporaries as much as on himself; for his parsimony and egotism resulted from neglect and contempt that have reduced less earnest men to want and despair. His fine Prose Essays, edited by Grosart, were published in 3 vols. 1875. The best edition of W.'s *Poems* is that of Moxon (6 vols. 1874). Interesting glimpses of the poet are given in his sister's *Diary of a Tour in the Highlands* (1874). Memoirs of him have been written by his nephew Christopher W. (1851), and by Paxton Hood (1856). Many sketches of W. occur in the writings of his contemporaries, as in the reminiscences of Rogers, De Quincey, and Crabb Robinson; for definite criticism of his writings see Coleridge's *Biographia Literaria*, Jeffrey's *Essays*, Masson's *Essays* (1856); F. W. Robertson's *Lectures and Addresses* (1858); Shairp's *Essays and Studies in Poetry and Philosophy* (1868); Sir Francis Doyle's *Lectures on Poetry* (1869); and Hutton's *Essays* (1871).—**Christopher W.**, youngest brother of the poet, born at Cockermouth, June 4, 1774, after schooling at Hawkshead entered Trinity College, Cambridge, where he took his degree in 1796, and obtained a fellowship in 1798. In 1802 he published *Six Letters to Granville Sharpe on his Remarks on the Uses of the Article Definite in the Greek Testament.* Manners Sutton, Archbishop of Canterbury, thereupon appointed him his domestic chaplain, and he was presented with a rectory and the deanery of Bocking. His *Ecclesiastical Biography* (6 vols. 1810; reissue, 10 vols.) attracted the royal notice, and he became in 1814 rector of St. Mary's, Lambeth, in 1816 chaplain of the House of Commons, and in 1820 Master of Trinity College, Cambridge. His other works are *Sermons on Various Occasions* (1814), *Who Wrote Eikon Basilike?* (1824-25), *Charles I. Author of Eikon Basilike Further Proved* (1828), and *Christian Institutes* (4 vols. 1836). W. resigned his mastership in 1841, and died at his rectory of Buxted, Sussex, 1846.—**Charles W., D.C.L.**, son of Dr Christopher W., Master of Trinity, was born at Bocking, Essex, in 1806, was educated at Harrow, and entered Christ Church, Oxford. After a distinguished undergraduate career, he became B.A. in 1830. In 1829 he had been a member both of the Oxford Eight and the Oxford Eleven. He remained at the university for a year or two as tutor; in 1835 was chosen second master of Winchester College; and in 1846 accepted the wardenship of Trinity College, Glenalmond, Perthshire. This institution owes much of its success to W., who erected its chapel at a private cost of £8000. In 1852 he was made Bishop of St. Andrews, Dunkeld, and Dunblane. He is one of the New Testament Company for the Revision of the authorised version of the Bible. His chief works are *Græcæ Grammaticæ Rudimenta* (1839; now in its 16th ed.); *Christian Boyhood at a Public School* (1846); *The College of St. Mary Winton* (1848); *On Shakespeare's Knowledge and Use of the Bible* (1854); *Catachesis, or Christian Instruction* (4th ed. 1864); *A Greek Primer* (1870; 6th ed. 1879); and *The Outlines of the Christian Ministry* (1872).—**Christopher W., D.D.**, also son of Christopher W., born at Ashby, Norfolk, in 1807, after education at Winchester, entered Trinity College, Cambridge, and obtaining a fellowship there, travelled in Greece during 1832–33. The records of this tour are to be found in *Athens and Attica* (1836; 4th ed. 1869). After taking holy orders, W. became headmaster of Harrow School and public orator at Cambridge (1836), canon of Westminster (1844), and vicar of Stanford-in-the-Vale, Berkshire (1850). On February 4, 1869, he was consecrated Bishop of Lincoln; and in September of 1872 he took part in the Old Catholic Congress at Köln. His other works are:—*Ancient Writings Copied from the Walls of Pompeii* (1838); *Greece, Pictorial, Descriptive, and Historical* (1842); *The Correspondence of Richard Bentley* (1842); *Theophilus Anglicanus, or Instruction for the Young Student Concerning the Church* (1843; 10th ed. 1874); *Diary in France* (1845); *On the Canon of the Scriptures* (1848); *Lectures on the Apocalypse* (1849); *Memoirs of William W.* (1851); *St. Hippolytus and the Church of Rome* (1853); *Remarks on M. Bunsen's Work on St. Hippolytus* (1855); *Social Life at the English Universities in the*

18th C. (1874); *Sermons on the Maccabees and the Church* (1871); *Scholæ Academicæ: English Universities in the 18th C.* (1877), and *Miscellanies, Literary and Religious* (3 vols. 1879). W. has likewise published a *Theocritus* (1844), a well-known edition of the Greek Testament (4 parts, 1856–60), and *The Holy Bible, with Notes and Introductions* (2 vols. 1864 70).

Work, in physics, is defined by Clerk Maxwell as the act of producing a change of configuration in a system in opposition to a force which resists that change. For example, in raising a mass from the earth's surface, work is done in overcoming the attraction between the earth and the mass, *i.e.* in opposition to the weight of the mass, and the work done is measured by the product of this weight into the distance through which it is overcome. To do this W. a certain force must be applied, a certain transformation of Energy (q. v.) accomplished. The principle of W. done is, indeed, a particular statement of the doctrine of the conservation of energy, and was clearly enunciated, as far as it concerns pure dynamics, by Newton in the scholium to the third law of motion (see MOTION, LAWS OF). This scholium is thus paraphrased by Thomson and Tait (see their *Natural Philosophy*, vol. i. 2nd ed. 1879): 'W. done on any system of bodies has its equivalent in W. done against friction, molecular forces, or gravity, if there be no acceleration; but if there be acceleration, part of the W. is expended in overcoming the resistance to acceleration, and the additional kinetic energy developed is equivalent to the W. so spent.' Mathematically interpreted, this theorem is an explicit statement of the dynamical principle first formulated by D'Alembert in 1742, and still known by his name—a principle which enables us to write down the equations of motion for any system for which the equations of equilibrium have been investigated. Any alteration in the configuration of a material system indicates that W. is being done upon it by the forces to which it is subject. Hence, if P, Q, R, &c., be the forces acting upon a system, and if dp, dq, dr, &c., be the corresponding minute displacements produced in the first instant of time by those forces acting unconstrainedly, then, since Pdp represents the W. which would be done by P during this interval, and similarly for the others, the equation

$$Pdp + Qdq + Rdr + \&c. = 0$$

is the condition that no W. on the whole is done, and that the system is consequently in equilibrium. This is the so-called principle of *Virtual Velocities*, which Lagrange made the basis of his *Mécanique Analytique*, and is also a part statement of the conservation principle. See ENERGY, KINETICS, STATES.

Workhouse, an institution for the indoor relief of paupers. The early workhouses were to a certain extent Houses of Correction. Thus Bridewell was allotted to the City of London by Edward VI. for the correction and retention of the thriftless, vagrant, and disorderly poor. Indigence was formerly treated as penal, and the destitute and unfortunate shared the same fate as the rogue and vagabond. In the reign of Queen Elizabeth a number of workhouses were established, and some distinction was made between the two classes. The Act of 1723 (9 Geo. I. c. 7) authorised several parishes to unite in maintaining a W., which was the first step towards centralisation. The 'W. test,' by which applicants for relief were bound to enter the W. and submit to its discipline, was adopted, and was actively in force till 1815. The basis of a new system of public relief was laid by laws of 1834 and 1835. Commissioners were empowered to order a W. to be erected or hired, enlarged or altered, with the consent of the Board of Guardians elected by the parishes composing a poor-law union—each parish of the union to pay its proper proportion of costs according to the number of its poor. The administration of workhouses is now carried on under the Local Government Board.

Paupers are maintained by the parish upon which they have a claim by the laws of settlement, according to birth, parentage, marriage, residence, &c. No pauper who has been allowed to reside in a parish or union for a year is removable therefrom. Paupers are admitted to workhouses by a written order by the Board of Guardians, the relieving officer, or the master of the W. They are medically examined, cleansed, clothed in W. dress, and passed into their proper class. There is a classification of inmates according to sex, age, and physical or mental condition. Any money found on the person of an applicant is applied to the funds of the union. Inmates must set to work, leave off work, and go to bed according to the regulations. No food is allowed except the house dietary. A pauper must attend morning and evening prayers, and divine service every Sunday, but consideration is shown to his religious persuasion, and he may be visited by a minister of his own faith. Children are classified religiously according to the persuasion of their parents. Misconduct may be punished by solitary confinement and altered diet for short periods. Patients suffering from infectious diseases are usually sent for the time to public hospitals. The chief deterrent elements of the English W. discipline seem to be—(1) a diet inferior to that of the ordinary labourer, (2) constant confinement within W. walls, and (3) a task of hard work suited to age, strength, and capacity. Any adult may leave the W., unless there are medical objections, on giving reasonable notice, but cannot take away any clothes or other W. property without special permission. A chaplain, medical officer, master, matron, schoolmaster, and schoolmistresses are attached to each W. Workhouses are subject to the inspection of a visiting committee of the board of guardians. Casual wards are attached to workhouses for the relief of indigent wayfarers, called casuals in England and night-lodgers in Scotland. Casual adult males for one night in England receive lodging and 8 oz. of bread, or 6 oz. of bread and 1 pint of gruel or broth, and in return must break from 1½ to 2 cwt. of stones, and pick 1 lb. of unbeaten or 2 lbs. of beaten oakum.

Workhouses vary greatly in size. Liverpool, Manchester, and St. Pancras workhouses are among the largest in England. Some establishments, such as Poplar W., are ordinarily set apart exclusively for the able-bodied poor. There are over 600 unions in England and Wales, and on 31st December 1876, 149,853 individuals were receiving relief therein. The number on a given day is, of course, greatly less than the number receiving relief throughout the year. £1,534,224 was expended in England on indoor relief in 1876.

Workhouses are legally known as poorhouses in Scotland, in which country their regulations differ but slightly from those in England. Scottish poorhouses are regulated by the Board of Supervision, under whose approval they may be erected in any parish containing over 5000 inhabitants on a resolution of the Parochial Board. There were 62 poorhouses in Scotland in August 1877, with accommodation for 14,290 paupers. There are about 180 poor-law unions in Ireland.

Foreign Workhouses.—On the Continent outdoor relief is the rule, the helpless and homeless poor being cared for principally in the hospitals. In France it was decreed by the National Assembly in 1793 that central almhouses should be established for able-bodied beggars, but this was not carried out till 1808, when 58 departmental almshouses were opened. These institutions gradually became jails, hospitals, and asylums. After 1830 the system of departmental almshouses was revived on the principle that in future paupers should be incited to work. The Second Empire favoured central almshouses, of which in 1872 France possessed 46. They cost less than 1,000,000 francs, and supported 5470 persons. There are no indoor paupers in France, saving lunatics, the sick and infirm, and neglected children. Foundling children when possible are not maintained in hospitals, but are put out to nurse in the country. In Holland, all vagrant and able-bodied paupers are compelled to work at the three pauper colonies of Amsterdam, Middelburg, and Groningen, besides which free pauper colonies for destitute families are supported by private charity. There are 2150 almshouses, and over 50,000 paupers, in Sweden. Central workhouses and almshouses exist in every province of the German Empire. A W. was erected by Friedrich II. in Berlin in 1742 as a house of correction, and is still in existence as a place of shelter. The number of indoor poor in Prussia averages less than 50,000. Pauper children here are boarded out. In the Austrian Empire public assistance is organised on the communal or municipal basis. The system of outdoor relief, applied under strict supervision, is extending all over the world, combined with judicious indoor relief in popular communities.

United States.—In most of the United States, workhouses, or, as they are there called, almshouses, are maintained in towns and counties. There are 600 almshouses in New England, with State almshouses in Massachusetts and Rhode Island. Outside of New England the indoor poor are usually maintained in the county almshouses, lunatic asylums, and orphan homes. Each state is responsible for its own poor-laws. Among the

most celebrated almshouses in America are those on Blackwell Island, New York, that on Deer Island, near Boston, and the Philadelphia County Almshouse. The workhouse on Blackwell's Island is on the cellular system, the inmates being locked up in cells when not at work or meals. The men are employed at getting out stones, making roads, building sea-walls, &c., and at various trades; and the women at needlework and washing ten hours a day. Accounts may be kept here with paupers, charging them for maintenance and giving a fair compensation for labour, any balance to be paid over on the pauper's discharge. See article on POOR AND POOR-LAWS, and authorities there quoted; also Archbold's *Poor-Law* (13th ed. 1878), and *Parliamentary Report on Poor-Laws of certain of the United States*, by J. J. Henley (August 1877).

Work'ing Draw'ings are drawings on a scale sufficiently large to exhibit with clearness and accuracy the details of a work for the guidance of workmen, as builders, decorators, engineers, pattern-makers, &c. In some cases W. D. are made of the actual size of the object to be executed. They are generally drawn in outline, and the sections are tinted to render them the more obvious.

Work'ing Par'ty, in the army a body of soldiers told off for manual labour. When the work is necessary for military exigencies, such as the throwing up of works, clearing space for a camp, &c., no working pay is allowed; but when men are employed as artificers or labourers on permanent military works, roads, &c., they may, under the Queen's Regulations, be granted a small extra remuneration in addition to their ordinary pay.

Work'ington, a seaport of Cumberland, England, 7 miles N. of Whitehaven by rail, stands on the Derwent, a mile above its mouth. Finer than either of its two Anglican churches is a Catholic church, erected in 1876 at a cost of £10,000; and other buildings are a corn-market, assembly rooms, dispensary, &c. The harbour, improved by the construction of a breakwater (1873), was entered in 1878 by 956 vessels of 107,947 tons, and cleared by 926 of 103,224 tons, the imports amounting (1877) to £21,269; the exports (coal and iron) to £142,612 (£225,236 in 1873). Shipbuilding (12 British vessels of 10,309 tons in 1874-78), the manufacture of iron, and coal-mining are the leading industries of W., which publishes one weekly newspaper. Pop. (1871) 8413. W., by Leland described as a 'lytel prety fyscher town,' was the place where Mary Queen of Scots landed in her flight from Langsyde, May 16, 1568.

Work'shop Regula'tion Act, 1867 (30 & 31 Vict. c. 46), is an 'Act for regulating the hours of labour for children, young persons, and women employed in workshops; and for other purposes related thereto.' It extends the protective legislation of the Factory Acts to small establishments, a workshop signifying any room or place whatever, whether in the open air or under cover, in which any handicraft is carried on. Its provisions are (1) that no child under the age of eight shall be employed, (2) that no child under thirteen shall be employed for more than six and a half hours in one day, which must be between 6 A.M. and 8 P.M., (3) that no young person under eighteen or woman shall be employed more than twelve hours in one day, which must be between 5 A.M. and 9 P.M., and must embrace an intervening period of rest of one and a half hours, (4) that no child, young person, or woman shall be employed on Sunday, or after 2 on Saturday afternoon, except where not more than five persons are employed, and where retail articles are sold or repaired, and (5) that no child under eleven be employed in grinding in the metal trades, or in fustian-cutting. Every child must attend school a certain number of hours in the week. Masters in the grinding trades must take measures to protect their workmen from the inhalation of dust. The Act does not apply to bakehouses as defined by the Bakehouse Regulation Act, 1863. Penalties of not more than £3 upon occupiers of workshops, and 20s. upon parents of children, may be enforced. The inspectors and sub-inspectors of factories may enter any workshop at any time to see that the provisions of the Act are not infringed.

The W. R. A., 1871 (34 & 35 Vict. c. 19), is an Act for exempting persons professing the Jewish religion from penalties in respect of young persons and females professing the same religion working on Sundays. The Factory and Workshop Act, 1871 (34 & 35 Vict. c. 104), makes exemptions in factories and workshops in cases of trades dependent on the weather and seasons to the effect that young persons of fourteen and upwards may work fourteen hours for ninety-six days in the year, but not for more than five days in one week. By the statute of 1878 (41 Vict. c. 16) the Acts relating to factories and workshops were consolidated.

Works and Public Buildings, Board of, by the constitution of 1851 was invested with the control of public works and buildings, the management of the parks in the metropolis, besides those of Richmond, Greenwich, Bushy, Phœnix, and Holy Rood, together with the gardens at Kensington, Kew, and Hampton Court, but it was relieved of its duties in connection with the metropolis by the Metropolis Management Act of 1855 and subsequent Acts, by which a special Metropolitan Board of Works was created, to whose energy London owes its Main Drainage, the construction of the Victoria, Albert, and Chelsea embankments, and the opening up of numerous fine streets. The powers of this local Board are extensive, embracing, besides the control of streets, the gas, water, tramways, artisans' dwellings, contagious diseases (animals), slaughter-houses, explosive substances regulations, &c. It raises money not only for its own purposes, but for advances to the London School Board, the vestries, District Boards, Boards of Guardians, &c. Members are elected by the respective vestries and district boards in the metropolis. The Corporation of the City of London elect three members. For the year ending December 31, 1877 it disbursed £2,314,281. The *B. of P. W. and B.* is under the control of the Treasury, whose sanction must be obtained for all important outlays. Its members consist of a First Commissioner, who is a political officer and has a seat in the Cabinet, the Secretaries of State, and the President and Vice-President of the Board of Trade. The expenses of the department are annually voted by Parliament. In 1879 these amounted to £39,850.

Work'sop, a town in Nottinghamshire, England, on the Ryton, 146 miles N.N.W. of London by rail. From the number of mansions and parks in the neighbourhood, the district has been designated the 'Dukery'—the principal being Clumber Park, the seat of the Duke of Newcastle; W. Manor, formerly belonging to the Duke of Norfolk, now to the Duke of Newcastle; Welbeck Abbey, the seat of the Duke of Portland; and Thoresby Park, recently of the Duke of Kingston, now of Earl Manvers. The parish church is one of the finest examples of late Romanesque style in England. Other notable buildings are the town-hall and corn-exchange in the Venetian style (1854), the moot-hall, a very ancient structure, formerly used as a town-hall, the savings-bank (1843), and the mechanics' institute with a library of 2000 vols. W. manufactures Windsor chairs, has a large malt and flour trade, and is a considerable depôt of hard and soft timber for railway purposes and for the Sheffield trade. Pop. (1871) 10,409. See *W., the Dukery, and Sherwood Forest* (Worksop 1875).

Worm Fever is a popular though erroneous term sometimes applied to Typhoid or Enteric Fever (q. v.) in young children.

Worm Grass. See SPIGELIA.

Worms, an island belonging to the Russian province of Esthonia, lying between the island Dagö and the mainland. Area 34 sq. miles; pop. 1200. W. is flat in the interior. The inhabitants are of Swedish origin, and have preserved their language. Their chief occupations are tillage, fishing, piloting, cattle-rearing, and the making of goats'-milk cheese.

Worms, one of the oldest towns of Germany, in Hessen-Darmstadt, in the rich plain of the Wonnegau, ¾ mile from the left bank of the Rhine, 40 miles S.S.E. of Mainz by rail. It is irregularly built, and is still in part surrounded with its ancient walls, within the ample circuit of which, however, are many vacant spaces once covered with populous streets and fine buildings. The principal edifice in the town is the venerable cathedral (founded in the 8th c., completed and consecrated in 1101), a noble Romanesque structure with four elegant towers, two domes, and a double choir. The interior is 357 feet long, 87 feet wide (across the transepts 117 feet), and is very imposing from its grand simplicity. On the N. side of the cathedral is the site of the Bischophof or episcopal palace, the seat of the diet of April 1521. It was destroyed by the French in 1689, and again in 1794. On its massive red sandstone substructure

the Heil'sche Haus has been erected in the rich Renaissance style. Outside the town stands the Liebfrauenkirche (dating from the 15th c.), which gives its name to the *Liebfrauenmilch*, a much-esteemed wine grown in the vicinity. The finest monument in W. is that to Luther, erected from Rietschel's designs in 1868 at a cost of £17,000. The principal industries of W. are the manufacture of patent leather (employing 2000 persons), tobacco, beer, soap, and amber wares. Pop. (1875) 16,597. W. is one of the most historical towns of Germany. It was known to the Romans as *Borbetomagus*, and later as *Augusta Vangionum*, the capital of the Vangiones. It was destroyed by Attila and rebuilt by Chlodwig in 486. After the partition of the empire among the sons of Ludwig the Pious, W. became a German free-town under the protection of the Elector of the Palatinate. Already in 1255 it belonged to the Confederation of Rhenish towns, and it contained in the time of Friedrich Barbarossa 70,000 inhabitants. It was the seat of many Imperial Diets, most famous that under Karl V., which Luther made memorable to the world. In 1632 the suburbs of the town were levelled by the Swedish Colonel Haubold, and in 1689 the town itself was ruthlessly destroyed by Melac and the young Duc de Créqui under the orders of Louis XIV. In September 1792 part of it was levelled by the French under Custine, and at the Peace of Lunéville in 1801 it was given to France. The Peace of Paris in 1814 gave it back to Germany, and the Vienna Congress in 1815 to Hessen-Darmstadt. See Fuch's *Geschichte der Stadt W.* (Worms 1868).

Worms may be taken to indicate (1) the class *Annelida*, the members of which have jointed bodies, and want true articulated appendages. Examples are found in (*a*) the order *Suctoria* or *Hirudinea*, including the leeches, &c.; (*b*) the *Oligochætæ*, represented by the earthworms; (*c*) the *Tubicola*, or tube-dwellers, represented by the marine *Serpulæ* and *Sabellæ*, &c.; and (*d*) the *Errantia*, represented by the *Lob Worm*, the *Nereis*, *Eunice*, and other marine forms; (2) to such animals as the parasitic Tapeworm (*Tæniada*), the *Nematoid* W., the Thorn-headed W., and allied forms. A tapeworm differs from an ordinary worm in the compound nature of its body. Each 'joint' or *proglottis* is a complete being having a set of generative organs. By many authorities the tapeworms and their neighbours, ranked with the *Echinodermata* as the division *Scolecida*, are regarded as merely a lower branch of the Annulosa. The following particulars may serve as a succinct account of the Annelida or true W. Two classes are included in the *Arthropoda;* namely, Class 1, Gephyrea, ex. Spoon W. (*Sipunculus*). Class 2, Annelida, ex. Earthworm (*Lumbricus*). Class 1 (Gephyrea).—In this class are included the various species of spoon W. (*Sipunculoidea*), small worm-like forms, which inhabit the sand of our coasts, or seek protection in the cast-off shells of certain mollusca. They exhibit the essential annulose characteristics, the body being segmented, and the nervous system consisting of the typical ventral gangliated cord. Lateral appendages are wanting, as also are eyes and other organs of sense. A proboscis bearing the mouth, and surrounded by tentacles, is situated anteriorly, the posterior part of the body being comparatively thick and muscular. Class 2 (Annelida).—This class is as extensive as the preceding was limited. It includes the various kinds of W. The body in general is distinctly segmented, each zone or segment being furnished with locomotive appendages. A detached segment of the body of a typical annelid consists of two halves or arcs, named, from their position, the 'dorsal' and ventral arcs. From the sides of each, certain processes, termed 'parapodia' or 'foot-tubercles,' arise, and of these, four exist to each segment, two borne by each arc of the segment. The tubercles on the dorsal arc are termed, from their position, 'notopodia;' those of the ventral half, from their proximity to the nervous system, are known as 'neuropodia.' The terms 'dorsal oar' and 'ventral oar' are sometimes used synonymously with the above. Each 'oar' or 'parapodium' bears two distinct kinds of appendages, (1) bristles or 'setæ,' which form the bulk of the organ; (2) a soft tentacular filament, to which the name of 'cirrhus' is applied. These organs materially assist locomotion. The head is generally differentiated from the other segments, and in many cases is furnished with eyes, antennæ, and similar organs. The digestive system includes a mouth—provided, in some instances, with a series or jaws—a stomach, and intestine. The respiratory organs consist of skin-sacs or pouches, or of *branchiæ* or gills; whilst in the lower forms breathing is performed by the general surface of the body. The nervous system consists of the typical gangliated chain, the anterior ganglia showing a tendency to coalesce together, so as to form a rudimentary 'cerebral' mass or brain.

Worms, *as a Disease.* W. frequently inhabit the intestinal canal in children, and they often aggravate or even give rise to gastric and intestinal disorders, while the irritation which they produce is frequently propagated to the spinal cord, giving rise to convulsions or other formidable nervous symptoms. Although intestinal W. are more frequent in early life than in adult, no species of them are peculiar to infancy. The *Ascaris vermicularis*, or small thread-worm, which inhabits the rectum, is very troublesome from the local irritation which it excites. The long thread-worm, *Trichocephalus dispar*, inhabits the upper end of the large intestines, and frequently co-exists with ascarides in the rectum. The *Ascarides lumbricoides*, or round-worm, is much less common in this country than the small thread-worm. It dwells in the small intestines, and sometimes passes into the stomach, whence it is rejected by vomiting. The tape-worm—of which there are two varieties, the *Tænia solium* and *Tænia lata*—is seldom met with in children under seven years of age.

The small thread W. produce a most distressing itching and irritation about the anus, which is always most troublesome at night and frequently prevents the child from getting sleep. Sometimes they give rise to troublesome diarrhœa and tenesmus, or straining at stool, and in female children they may pass into the vagina and cause Leucorrhœa (q. v.). Round-W. very frequently give no evidence of their existence, the expulsion of one by stool or by vomiting being often the first indication of their presence. It is commonly believed that children infested with lumbrici have inordinate appetites, as the W. subsist on the contents of the alimentary canal, and not on the juices of the lining structures themselves, as in the case of tape-W. The irritation caused by the W. often produces troublesome diarrhœa, but this condition favours their expulsion. It occasionally happens that round W. pass from the stomach into the œsophagus, and from thence into the nostrils or larynx, and cause death. The irritation caused by W. frequently gives rise to violent convulsions and other cerebral symptoms. The symptoms of tænia or tapeworm are common to it and to the lumbrici; but the tape-worm is apt to produce a more decided impairment of the general health, and its symptoms are usually more persistent.

The different varieties of W. require different modes of treatment. Thread W. are scarcely affected by internal remedies taken by the stomach; but their destruction and expulsion is certain by the administration of medicated enemata. For this purpose lime-water enemata may be given; or six ounces of lime-water and two drachms of the tincture of the sesquichloride of iron. Küchenmeister, the greatest authority on helminthology, also recommends santonin in an enema in the proportion of from four to eight grains. For the expulsion of the round W. santonin in small doses is by far the safest and most efficacious remedy. For a patient six years old, two or three grains may be given at night followed by a full dose of castor-oil in the morning, and this should be repeated two or three times in succession. Santonin has no effect upon tapeworm; for the cure of which, as well as lumbrici, cusso, oil of male fern, or kamella, are the most effectual remedies.

Worm Seed is the unexpanded flower-heads of *Artemisia maritima*, var. *Stechmanniana.*

Worm'wood (*Artemisia Absinthium*), a strong-growing aromatic perennial, covered with a silky pubescence, and native over a wide range in the N. hemisphere. It is found wild in some parts of Britain, but is more commonly seen as a cottage-garden plant, having been formerly much employed as a vermifuge and a tonic. Its active properties depend on a volatile oil peculiar to the species, a bitter principle called absinthine, and absinthic acid.

Wor'num, Ralph Nicholson, an English art-critic and historian, was born at Thornton, Northumberland, December 29, 1812, and studied at University College, London. During 1834-39 he carefully examined the art-galleries of the Continent,

and on his return to England contributed articles on his favourite subject to the *Penny Cyclopædia*, and to Dr. Smith's *Dictionary of Greek and Roman Antiquities.* In 1845 he was appointed to draw up the official catalogue of the National Gallery, became art-lecturer to the Government Schools of Design (1848), librarian to these schools (1852), and Keeper and Secretary of the National Gallery (1855). He died at Hampstead, December 15, 1877. W. wrote *A Sketch of the History of Painting* (1846; 4th ed. 1861), *Analysis of Ornament* (1856), *The Epochs of Painting, a Biographical and Critical Essay on Painting and Painters of all Times* (1864), and a *Life of Holbein* (1867). He also edited Walpole's *Anecdotes of Painting* (1839; new ed. 1862), and the *Lectures on Painting* (1848) by the Royal Academicians Barry, Fuseli, and Opie, besides publishing many special essays, reports, catalogues, &c.

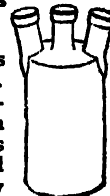
Worsaae', Jens Jakob Asmussen, the eminent archæologist, was born at Veile in Jutland, Denmark, 14th March 1821. He studied at Copenhagen first theology, then law, and from 1838 to 1843 was assistant at the Royal Museum for Northern Antiquities. After several scientific tours in Denmark, Sweden, and Norway, he visited Germany in 1845, and published at Copenhagen in 1846 *Die Nationale Alterthumskunde in Deutschland.* In 1846–52 he investigated the traces of the Northmen in England, Scotland, Ireland, France, and Italy. Appointed (1847) Government Inspector of Antiquities in the Danish State, W., along with Thomsen, was charged (1849) with the formation of a special commission for the preservation of Danish antiquities, and in 1865 he was appointed director of the Royal Museum and of the collection in Rosenborg Castle. From July 1874 to June 1875 he was Church and Education Minister under Fonnesbech. W. has also written *Danmarks Oldtid* (Copenh. 1843; Eng. trans. 1858); *Blekingske Mindesmærker fra Hedenold* (1846); *Danevirke* (1848); *Om Danmarks Tidligste Bebyggelse* (1851); *Minder om de Danske og Nordmandene i England, Scotland og Irland* (1852; Eng. trans. Lond. 1852), *Afbildinger fra det Kongelige Museum for Nordiske Oldsager* (1854), *Den Danske Erobring af England og Normandiet* (1863), *Den jydske Halvo og den Fortidsminder* (1864), and *Om Slesvigs eller Sonderjallareds Oldtidsminder* (1865), besides numerous articles in Scandinavian periodicals.

Wors'ted is a variety of woollen yarn made from long wool and prepared for spinning by a process known as combing. See WOOLLEN and WORSTED MANUFACTURES.

Worth'ing, a well-known watering-place in Sussex, on the coast of the English Channel, 10½ miles W. of Brighton by rail. It is well sheltered on the N. and N.E. by hills, but its chief attractions are its reputed salubrity, its fine and extensive sands, and its long and wide esplanade. W. of the town is the site of Dr. Richardson's proposed 'city of health,' the ground for which has been bought at a cost of £30,000. Pop. (1871) 7413. See G. F. Chambers, *Handbook to the County of Sussex* (Lond. 1877).

Wott'on, Sir Henry, born at Boughton Malherbe, Kent, March 30, 1568, was bred at Winchester, New College, and Queen's, and making the 'grand tour' (1589–97), met at Geneva Beza and Casaubon. Secretary to Essex, he fled, upon Essex's fall, to Tuscany (1600), whose Grand-Duke sent him disguised to Scotland, to warn James VI. of a plot to poison him. James, taking this 'honestest dissembler' into high favour, despatched him on embassies to most of the European courts, and at Venice W. formed a close friendship with Fra Paulo Sarpi, whose *Istoria del Concilio Tridentino* he transmitted to James, sheet by sheet, as it was written. Over-freedom of speech—his saying, namely, that an 'ambassador is a good man and true sent abroad to lie for his country's good'—caused W.'s disgrace, but in 1625 he received the provostship of Eton College, which, with angling and philosophy for recreation, he held till his death in December 1639. Author of poems and sundry treatises, as well as of many sage and quick apothegms, W. chose for his epitaph—'*Hic jacet hujus sententiæ primus auctor: Disputandi Pruritus sit Ecclesiarum Scabies. Nomen alias quære.*' See a Life by Izaak Walton prefixed to his edition of the well-known *Reliquiæ Wottonianæ* (1651).

Woulfe's Bottles, a form of chemical apparatus consisting of bottles of glass or earthenware, fitted with two or three necks, and used in preparing solutions, and in generating gases.


Woulfe's Bottle.

Wounds may be defined as violent solutions of continuity in the soft tissues of the body. Mr. Paget classifies W. as follows:—*Open* and *subcutaneous* W.; the former including those in which the outer part of the wound is almost or quite as extensive as the deeper part; and the latter, all those in which the outer part of the wound is very much smaller than the deeper part. These W. are further divided into (1) *incised* W., such as cuts or incisions, including those which remove a portion of the body; (2) *punctured* W., such as stabs; (3) *contused* W., in which the divided parts are bruised or crushed; (4) *lacerated* W., in which there is tearing of the tissues; (5) *poisoned* W., in which some poison or venom is inserted; and (6) *gunshot* W., which may appear in a great variety of forms.

Simple or *incised* W. are the most common variety. In a clean cut, three phenomena are invariably present, viz., opening or gaping, bleeding, and pain. *Gaping* is caused principally by retraction of the skin; the elastic and cellular or connective tissues; the arteries, muscles, fibrous tissues, nerves, and cartilages. The *bleeding* depends chiefly on the size and number of the vessels divided, and on their connection with the surrounding parts. Regarding *pain*, Mr. Paget says, 'There are differences in both the kind and degree of pain, according to the place and manner of the wound. Thus, in regard to the skin, wounds of the face and of the extremities of the fingers and toes seem to be among the most painful; those of the back amongst the least so; and wounds cut from within are less painful than those from without. The skin appears to be far more sensitive to W. than any of the deeper structures, except the nerves of sensation themselves; but any part (as periosteum or tendons) may become, by disease or distention, highly sensitive.'

When the surfaces of a clean-cut wound are brought into close approximation, and kept so for a sufficient length of time, say from twenty-four to forty-eight hours, there will probably be no appreciable signs of inflammation, and the wound will be so soundly united as to require no further attention, nothing being left except a linear mark, which, in the case of small cuts, may eventually disappear entirely. This method of union is called *primary adhesion* or *immediate union.* In other cases a small quantity of blood is effused from the cut surfaces, which may be either entirely absorbed or a portion of it may become organised; and, in the latter case, the amœboid leucocytes absorb into their tissue material for their nutrition from the neighbouring plasma. Masses of protoplasm are formed, around which a cell-wall is developed; and the nuclei of these cells divide and multiply to form new cells. The rounded cells then elongate into fibre-cells, out of which are formed the fibrous elements of the connective and vascular tissues; the neighbouring vessels shoot out processes into the growing tissue; the unused serum, &c., is reabsorbed, and thus the wound is closed by new material with no formation of pus. This process is called *union by first intention*, or *primary union.* But the inflammatory leucocytes may, instead of developing into fibre-cells and forming tissue, become developed into *pus-globules*, and the exudation break down into a creamy fluid called pus, which consists of these globules floating in serum, the *liquor puris.* The cavity of the wound is closed by the organisation of the processes called 'granulations,' and *union* finally takes place by the *second intention.* In *suppurative union*, or union by the *second intention*, more time is required, there is more destruction of tissue, the bond of union is more lowly organised, and is more prone to degenerations than union by the other modes, and all the symptoms affecting the patient's health are more severe. Some other processes of union are described by Mr. Paget; viz., *union by the third intention*, and *union under a scab.* In the former case perfectly healthy granulating surfaces being brought evenly together throughout, they will adhere without any further suppuration, and thus the wound will be closed perfectly and at once. Union under a scab may take place in fresh W. or in granulating W.

The object to be aimed at in the dressing of W., is to procure, if possible, union by primary adhesion or by the first intention; and, to attain this, various modes of dressing have been proposed. Dr. Humphrey teaches that W. do best when freely exposed to

the air without any dressing; while Professor Lister contends that the air contains all the germs of putrefaction, and that its exclusion is necessary for the rapid and healthy healing of all W. Sir W. Fergusson repudiates all special methods of treating W., and thinks that, as a general rule, they do better with water-dressing than with any other application. Whatever mode of dressing W. is adopted, it is necessary that scrupulous care be taken that all the materials used are clean, and that no impurity can afterwards find access to them. The method proposed by Professor Lister, called the *antiseptic system*, is that which finds most favour with surgeons at the present time. The principles of the method are: (1) to destroy any germs of putrefaction which may have been accidentally implanted in the wound before it is dressed, and to guard against such implantation; (2) never to allow the access of air to the wound except filtered through the antiseptic; and (3) to provide for the drainage of decomposable fluids from the wound without admitting the entrance to it of unfiltered air. For details, see Professor Lister's article in Holme's *System of Surgery*, vol. v. p. 621, 2d ed., and Mr. Paget's article on W. in Holme's *System of Surgery*.

Wou'verman, Philipp, a famous Dutch painter, born at Haarlem in 1620, studied under his father and his countryman Joh. Wynants. He worked hard to support a numerous family, but the traders and not the artist grew rich by his labour. He died at Haarlem, 19th May 1668. He painted landscapes, hunts, horse-fairs, cavalry skirmishes, fishermen and their boats, &c. He was particularly fond of introducing horses, and a white one is a characteristic of his works. All his pictures display a freedom, lightness, and naturalness that can hardly be surpassed. The best collection is in the Royal Gallery of Dresden. There are also fine examples in the Louvre, and in Munich, Vienna, St. Petersburg, Amsterdam, the Hague, Rotterdam, &c. The most complete enumeration of his works is to be found in Smith's *Catalogue Raisonné* (vol. i. Lond. 1829). See Kämmerer, *Ueber die Composition in Philipp W.'s Gemälden* (Lond. 1789).

Wrack, or **Sea-Wrack**, is a general term for the larger kinds of seaweed cast ashore by the waves, but is applied in a special sense to the species of *Fucus*, which form the bulk of the W. collected for manure, and formerly for making kelp. Most of the species are confined to the northern seas, and many grow in situations where they are more or less exposed at low water. The genus is distinguished by having flat or compressed forked fronds; air-vessels when present formed by the occasional swelling of the branches, or in their substance; and receptacles filled with mucus, traversed by a network of jointed filaments (*Berkeley*). *F. serratus* (Black W.), *F. nodosus*, and *F. vesiculosus* (Bladder W.), are as common round the British coasts as grass in the fields. Oxen, sheep, and deer sometimes browse on W. when other food is scarce.

Wrang'el, Friedrich Heinrich Ernst, Graf von, was born at Stettin, April 13, 1784, entered the army in 1796, distinguished himself in the War of Liberation, especially at Hainau and Leipzig, became lieutenant-colonel in 1814 and colonel in the following year. In 1848 he led the Second Corps d'Armée in the Schleswig-Holstein campaign, and in 1849 was appointed to the command of the Third Army Corps. In 1856, on the anniversary of his sixtieth year of military service, he was promoted to the rank of Field-Marshal. In 1864, in the war with Denmark, he held the supreme command of the Austro-Prussian army from January to May, when he resigned it to Prince Friedrich Karl, receiving at the same time the title of 'Graf.' In the war with Austria in 1866 he accompanied the army without holding a command. 'Papa W.,' as the aged veteran was named by the Berlin populace, who loved him for his habitual disregard of grammar, died at Berlin, November 1, 1877.

Wrang'ler. See CAMBRIDGE.

Wrasse, the name applied to a *Teleostean* fish belonging to the family *Labridæ*, in which the mouth is provided with thick fleshy lips. There is one dorsal fin opening in front, and the scales are *cycloid*. The ventral fins are situated beneath the pectorals. The Ballan W. (*Labrus bergylta*) is a familiar species, attaining a length of from 12 to 16 inches. It is red above, and variegated with green on the sides; the fins are green spotted with red, and the abdomen is orange yellow. The Ballan W. is also known by the names 'Ancient W.' and 'Old Wife.' It inhabits the rocky parts of coasts. The *Labrus trimaculatus* or three-spotted W. is another species, of a rich orange hue, and marked with purple and pale rose spots on the back and dorsal fin. The green-streaked W. (*Labrus Donivani*) is a rarer species, named from its peculiar colour.

Wreath (Old Eng. *wrædh*), in heraldry, an addition to the Shield (q. v.), representing two cords of silk, of the two chief cinctures of the arms, twisted together into a roll. The crest is always imposed upon a W., save where it issues from a coronet, or is placed upon a chapeau.

Wreck and Sal'vage. By 17 and 18 Vict. c. 104, when any ship or boat is stranded, or in distress on any shore or tidal water of the United Kingdom, any one assisting to save the lives of those in the endangered vessel, or to save the vessel itself, or its cargo, shall be entitled to receive from the owners a reasonable sum, besides expenses. This payment is called *salvage*. No receiver of wreck is entitled to salvage. Salvage on account of preservation of human life has priority to all other claims for salvage. When a stranded vessel is plundered, the inhabitants of the *hundred*, or district in which the offence is committed, are liable in manner provided by the Act 8 Geo. IV. c. 31.

Wre'de, Karl Philipp Fürst, a Bavarian field-marshal, born at Heidelberg, 29th April 1787. His family was noble, and W. was early employed in state service. In 1793 he was made land commissary in the Palatinate, and in that capacity moved about for five years with the Austrian armies. In 1799 he raised a body of Bavarian volunteers for the Archduke Karl, and took part in the campaigns of 1799 and 1800. He fought at Hohenlinden as a major-general, became lieutenant-general in 1805, and when Bavaria was forced to join France W. fought against his former allies. He commanded a Bavarian division at Wagram, was made a Count of the Empire by Napoleon, and did not abandon the French cause till after the disasters of the Russian campaign. In 1813 he found himself at the head of an Austro-Bavarian army of 70,000 men, and though beaten by the French at Hanau (October 30–31) and at other places, he materially assisted in the advance on Paris, and on the 9th of June 1814 was made field-marshal, and received Ellingen in Nordgau as an hereditary princedom, under Bavarian supremacy. At the Congress of Vienna he worked for the interests of Bavaria, became commander-in-chief of the Bavarian Army in 1822, and died at Ellingen 12th December 1838.

Wren (popularly in parts of Britain 'Kitty W.'), the name given to more than one species of *Insessorial* birds. The typical and common W. is the *Troglodytes vulgaris* of ornithologists, which attains a length of 4 inches. It is of a reddish-brown colour, which becomes pale on the under parts. The eggs are small and number from six to eight, and the entrance to the nest, which is dexterously built, is from the side. The W.'s song is sweet and powerful. Two broods are produced annually. The name W. is applied to other *Insessorial* birds, such as the Emen W. of Australia (*Stipiturus malachurus*), one of the *Malurine* birds, brownish in colour, and remarkable for the development of its tail feathers. The gold-crested W. (*Regulus cristatus*), a common British species, attaining a length of 3 inches, is distinguished by the golden crest of feathers borne on the head, and which it can raise or depress at will. Its upper parts are of a brown colour, tinted with green, the under parts being grey tinted with yellow. The *Regulus ignicapillus* or fire-crested W., allied to the preceding, also occurs in England, but is rarer than the golden-crested W. The Dalmatian Regulus (*R. modestus*) is in turn allied to both. In N. America a species of W. allied to the common European W. occurs. The house W. (*Troglodytes asdon*), and the winter W. (*T. hyemalis*), are also familiar species in the New World. The latter is a bold, pugnacious bird, attacking birds larger than itself, and has even been known to face cats which have approached to its nest. Its average length is 5 inches.

Wren, Sir Christopher, son of a dean of Windsor, was born at East Knoyle, Wiltshire, October 20, 1632, was trained at Westminster school under the famous Dr. Busby, and at the age of fourteen entered as a gentleman-commoner Wadham College, Oxford. Immediately after taking his degree of M.A. he was elected a fellow of All Souls. Already he was giving

proof of his extraordinary universality of talent, as in a long Latin poem, *Zodiacus Reformatus*. His mathematical studies were carried on with men like Dr. Wilkins and Dr. Seth Ward; and the intimacy of the three afterwards gave rise to the Royal Society. In 1657 W. became Gresham professor of astronomy in London, and three years later he obtained the Savilian chair of the same science at Oxford, and soon after the honorary degree of D.C.L. In 1661 he was associated with Sir John Denham, 'clerk of the royal works,' who was a good courtier, a passable poet, but an incompetent architect. W. proved as clever an architect as a mathematician, and in 1663 took a commission for the Oxford Sheldonian Theatre, the roof of which is still a marvel of scientific design. A visit to France at this time brought him into contact with Bernini, Mansard, and other celebrated architects. Having returned to England, he drew plans for the restoration of St. Paul's Cathedral; and these exist in the library of All Souls' College. But the Great Fire made a ruin of St. Paul's, and gave W. the fullest scope for his genius. After spending much time over splendid designs for the wide streets, squares, and quays of a new London, he began to build St. Paul's. He originally planned the edifice as a Greek cross, with a dome as large as that of St. Peter's at Rome. The form of the Latin cross, and other changes, some much for the worse, resulted from the Duke of York's interference. Begun June 21, 1675, St. Paul's took thirty-five years to build; yet its architect lived to see his son put the last stone on the lantern. It ranks next to St. Peter's, and for harmony of exterior effect excels that colossal basilica. W.'s other churches are too numerous to mention; in London alone he erected fifty-three, and of these the best remaining are St. Mary-le-Bow, St. Bride's in Fleet Street, and St. Stephen's, Wallbrook, with its exquisite interior. Of his other buildings may be mentioned Greenwich and Chelsea Hospitals, large portions of the palaces at Hampton Court and St. James's, the west front and towers of Westminster Abbey, the palace at Winchester, and the libraries of Trinity and All Souls. Knighted by Charles II. (1673), he married Faith, daughter of Sir John Coghill (1674), was elected President of the Royal Society (1680), and M.P. for New Windsor (1689). W., however, was not without envious detractors, who brought about his expulsion from all offices at the accession of George I. His latter years were spent at Hampton Court in active study, and he died at table, February 25, 1723, aged 91. 'Si monumentum requiris, circumspice,' are the words over his grave in St. Paul's. W. was the greatest of English architects, and, save Newton, the first mathematician of his time. He possessed a universality of power rare in men of science. He is said to have invented the method of mezzotint engraving, and designed many industrial and scientific instruments which in modern modifications have given fame to others. See *Parentalia*, a volume composed of biographical notes of his son Christopher, edited by his grandson Stephen W. (1750), and Elmes, *Memoirs of the Life and Works of W.* (Lond. 1823).

Wrex'ham, a town of Denbighshire, Wales, on the Gwenfrwry, 12 miles S.S.W. of Chester by rail. The handsome church of St. Giles, in the Perpendicular style (founded 1470), with a tower 135 feet high (finished 1500), and the town-hall, of brick, are the chief buildings. A free library was established in 1878. Collieries, iron mines, lead mines, red sandstone quarries, paper-mills, and breweries abound in the neighbourhood. Large markets are held here, the principal one beginning on March 23. W. unites with Denbigh, Holt, and Ruthin in sending a member to Parliament. Pop. (1871) 8576. W. was long an important town on the Welsh border.

Wright, Thomas, F.S.A., an English author and editor, was born near Ludlow in Shropshire, 21st April 1810, educated at Ludlow Grammar School, and graduated at Trinity College, Cambridge (1834). The year following he settled in London as a man of letters, was one of the founders of the 'Camden Society' (1838), of the 'Percy and Shakespeare Societies' (1840), and of the 'British Archæological Association' (1843), the Journal and publications of which he edited till 1849. W. became a corresponding member of the French Institute (1842), originated the annual archæological congresses in England (1844), and on several occasions successfully conducted local investigations. Napoleon III. chose him to translate his *Histoire de Jules César*. W. died at Chelsea, December 23, 1877. He wrote or edited over 100 volumes, nearly all relating to the history and antiquities of England, and though neither an exact scholar nor a penetrating critic his laborious industry merits praise. Besides editing and annotating many of the best national relics of mediæval literature in English, French, and Latin, he wrote among other original works a *History of Essex* (2 vols. 1831–35), *History of Ludlow and its Neighbourhood* (1841–43; new ed. 1852), *Biographia Literaria* (2 vols. 1842–46), embracing the Old English and Norman periods of our history, *England under the House of Hanover, illustrated from Caricatures, &c.* (2 vols. 1848), *The Celt, the Roman, and the Saxon* (1852; 3d ed. 1875), a *Dictionary of Obsolete and Provincial English* (2 vols. 1857), a *History of Domestic Manners in England during the Middle Ages* (1862), a *History of Caricature and the Grotesque in Literature* (1865), *Homes of Other Days* (1871), *Feudal Manuals of English History* (1872), and *Uriconium, an Historical Account of the Ancient Roman City* (1872).

Wright'ia, a genus of apocynaceous shrubs or climbing aerial-rooting trees, having opposite leaves, flowers in terminal corymbose cymes, and a long cylindrical fruit separating into two folicles, the oblong seeds bearing a tuft of long silky hairs at the base. W. ranges from the Himalaya to W. Australia. *W. tinctoria*, a common Indian species, has a pure white, close, and even-grained wood, much valued for turning and carving, and its leaves yield an indigo. Of *W. tomentosa*, the bark is administered against snake-bites and the stings of scorpions. The root, bark, and seeds of *W. antidysentrica* are astringent, and this tree furnishes a false Conessi Bark (q. v.), the true being the produce of *Holarrhena antidysenterica*.

Writ is a term of English law used to denote a formal document issued either under the private seal of the Courts, and not under the Great Seal of England, and therefore called a '*judicial* W.;' or one issued from Chancery, witnessed in the Queen's name, and known as an '*original* W.' But this distinction almost ceased under the Uniformity of Process Act, 2 W. IV. c. 39.

Wri'ter, in Scotland a term applied generally to legal practitioners in country towns. In Aberdeen these style themselves *Advocates*.

Wri'ters, or Clerks to the Sig'net, an important body of legal practitioners in Edinburgh, are said to have been anciently clerks in the office of the Secretary of State, by whom writs requiring authentication by the king's signet were prepared. When the College of Justice (q. v.) in Scotland was established, the W. to the S. exercised nearly the same functions as at present. Formerly the body possessed important legal privileges; but by the Act 36 and 37 Vict. c. 63 these have become little more than nominal. The Act creates a new body called 'Law Agents,' to which is given the exclusive right of practising before the supreme and inferior law courts of the country. Ordinarily an apprenticeship of five years, with passing of examination, is required for admission to the body; but a term of three years is held sufficient when the candidate is a graduate in law or arts, or when he is an advocate in Scotland, or barrister, or enrolled legal practitioner in England.

Wri'ters' Cramp, or Scriv'eners' Pal'sy, is a condition which occasionally follows the overstraining of groups of muscles, and is met with among those who are engaged in occupations which require the exercise of particular voluntary muscles of the upper and lower extremities to an excessive degree; as clerks, telegraphists, dancers, &c. After fatiguing and long-continued use of the pen, the hand may become at first tired; and afterwards sharp pains may be felt running from the hand up the arm. Dull pains are also felt in the ball of the thumb, the dorsal aspect of the fingers, the wrist, and at the exposed portion of the ulnar nerve at the elbow. There is first impaired writing power, and afterwards, when the individual persists in his attempts, slight convulsive movements. The fingers, forearm, and wrist, more especially the three first fingers of the right hand, may lose power, though sensation is rarely lost or impaired. The same form of cramp affects the thumbs and fingers of telegraphists and the feet of the solo-dancers of the ballet; and a similar affection is met with among violin-players, engravers, stenographers, type-setters, and cigar-makers. W. C. is more rare among those who write and meanwhile compose, than

among clerks and copyists; and the condition is, therefore, the result of an over-developed automatism.

The treatment of W. C. consists in cessation from the occupation which produced the affection, the administration of strychnia and iron, or conium; and excitation by electricity.

Wri'ting. See ALPHABET; CUNEIFORM; HIEROGLYPHICS; PHONETIC WRITING.

Wrong'ous Impris'onment, in Scotch law, is the illegal detention of the person either through violent seizure or through a breach of the rules that regulate legal procedure. The individual thus wrongously imprisoned has redress both at common law and by special statute. See FALSE IMPRISONMENT.

Wry'neck (*Yunx torquilla*), a species of *Scansorial* bird belonging to the family *Picidæ* or woodpeckers. It is a summer visitant in Britain, appearing about the same time as the cuckoo, and hence called 'cuckoo's mate.' It is about seven inches long, of a brown colour above, mixed with grey tints, and a dull brownish-white below. The eggs are laid usually in the hollow of a tree. The W. subsists chiefly on insects, for the capture of which its tongue is specially adapted.

Wry'neck is a common deformity in children from spastic contraction of the sternomastoid muscle by which the head is drawn towards the shoulder, and the chin turned to the opposite side. The contracted muscle stands out strongly under the skin, and sometimes the size of the features on the affected side is strikingly less than on the opposite. If the deformity be neglected, the clavicle itself may yield and be curved upwards. The trapezius, scalene, and other muscles are involved, but to a less extent. W. is usually due to congenital causes, though it may not be noticed till some years after birth. The only effective treatment consists in the division of the sternomastoid muscle by two punctures. The head should be put well on the stretch, and the knife should be entered behind the clavicular fibres, about half an inch above the clavicle, and passed beneath the muscle. Then its edge is turned towards the fibres, and they are divided completely. The same operation is performed with the sternal tendon. The head is afterwards kept in position by a suitable apparatus.

Instances of W. sometimes occur among children, depending either on irritation from worms, or on some cerebral cause difficult to detect, but somewhat analogous to hysteria. If the child be put under chloroform the deformity will disappear, showing that there is no shortening of the muscle. Adults sometimes suffer from spasmodic W., and the disease may be due to irritation propagated from the medulla along the spinal accessory nerve. W. is often also purely hysterical, and such cases are most difficult to treat.

Wupp'erthal, the busiest and most densely-populated valley of the German Empire, receives its name from the winding Wupper or Wipper, which, after a course of 64 miles, enters the Rhine between Koln and Düsseldorf. By W. is sometimes understood only the district between and embracing Barmen (q. v.) and Elberfeld (q. v.), which, since the intervening 4 miles of road are lined continuously by houses and factories, have come to be regarded as a single town, with a pop. (1875) of 167,071. Oftener, however, it is extended to the entire basin of the Wupper and its tributaries, and so comprises Remscheid (q. v.), Lüttringshausen (q. v.), Solingen (q. v.), Höhscheid (q. v.), Merscheid (pop. 10,017), Lennep (pop. 7753), &c., the pop. of the W. thus understood exceeding 324,000 persons, occupied chiefly in spinning, weaving, bleaching, dyeing, and iron-founding. The W. has not escaped the widespread manufacturing depression of recent years, the Barmen district exporting to the United States goods to the value of only £1,175,000 in 1876, against £1,275,000 in 1875.

Wurd'ha (*Wardha*), the chief town of the district of the same name, Central Provinces, British India, on the left bank of the W. river, 40 miles S.W. of Nagpur and 471 E. of Bombay. It was only founded in 1866; but as a station on the railway it has already become a centre of the cotton trade. The *district*, which was formed out of Nagpur in 1862, has an area of 2401 sq. miles; pop. (1872) 354,720. The staple crops are millet, cotton, wheat, and rice. Here is produced the well-known Hingunghat cotton, which is exported to the amount of 25,000 bales (of 400 lbs. each) a year. In 1875-76 the trade in cotton was valued at £41,000, and in country cloth at £19,000. The breed of cattle is good, especially the trotting bullocks. The railway now crosses the centre of the district.—The **W.** *river* rises in the Satpura hills, and flows S.E. for 254 miles to join the Weingunga; the united stream, under the name of the Pranhita, ultimately falls into the Godavery at Sironcha.

Wur'no, a town of the Central African state of Sókoto (q. v.), on the river Sókoto, 18 miles N.E. of the town of that name. It has a considerable trade in cotton, corn, and kola nuts. Pop. estimated at 12,000.

Wuro'ra (*Warora*), a town in the district of Chanda, Central Provinces, British India, on the left bank of the Wurdha river, 28 miles S.E. of Wurdhatown. Here is one of the largest coalfields in the peninsula. A shaft has been sunk, which passes through a coal-seam 15½ feet thick at a depth of 176 feet, and a little lower through another seam 11 feet thick. It is estimated that the field may afford an output of 100,000 tons per annum for 100 years. A narrow-gauge line (46 miles long) has been laid down to W. from Wurdha station on the Great Indian Peninsula Railway; capital expenditure up to 1877, £455,000; net earnings, £1989.

Würt'emberg (officially *Württemberg*, formerly *Wirtemberg*), a kingdom of S. Germany, bounded N. by Bavaria and Baden, W. and S. by the same countries, the Bodensee and Hohenzollern, and E. by Bavaria. Area, 7675 sq. miles; pop. (December 1, 1875) 1,881,505 (1,296,750 Protestants, 567,578 Catholics, and 12,881 Jews). The emigration to America, which in 1872-74 drew off 5000 a year, declined in 1875, and nearly ceased in 1876. The chief mountain-districts of W. are the Schwarzwald (q. v.), which occupies the W. part of the country, rising in the Hornisgrinde (locally called the Katzenkopf) to 3775 feet; the Alp (q. v.) or Swabian Jura, a wooded range of limestone mountains, which stretches in a N.E. direction towards Bavaria between the Danube and the Neckar, and whose highest points are in the S.W., the Oberhohenberg (3313 feet), the Lemberg (3326 feet), and the Plettenberg (3293 feet). To the N. of the Alp, and on both sides of the Neckar, extends a mountainous tract formed of numerous small groups under different local names, and nowhere rising above 1800 feet; to the S. of the Danube is a plateau averaging 1500-1900 feet high, with here and there heights, of which some rise to 2400 feet; and in the S.E. of the Donaukreis the Adelegg, culminating in the Schwarzegrat or Schwarzkopf (3644 feet). W. belongs partly to the basin of the Danube (q. v.), of whose course 90 miles are in W., but chiefly to that of the Rhine, which receives the Neckar (q. v.), the Murg, Kinzig, and Tauber. The Wilhelmskanal makes the Neckar navigable from Kronstadt to Heilbronn. Geologically, the Alp is Trias topped by the Jura formation, the 'Swabian and Franconian terrace-land' is Muschelkalk and Upper New Red Sandstone, and between Stuttgart and Reutlingen is Upper New Red topped by black Jura or Lias. The sole mineral products of W., exclusive of some alum and iron-vitriol, are salt and iron. The eighteen iron mines worked in 1876 produced 28,284 tons of ore, yielding 10,816 tons of pig-iron, valued at £186,104; while the salt prepared in the same year was 72,158 tons, worth £65,872. The climate of W. is temperate, averaging 45·6° F. In 1876 there were in W. 3410 sq. miles under tillage, employing about one-half of the population. The chief cereal crops were spelt (263,424 tons), oats (156,476 tons), barley (136,074 tons), rye (36,963 tons), and wheat (21,988 tons). In the same year were produced 717,593 tons of potatoes, and 519,072 tons of various kinds of beetroot, while the hay crop amounted to 1,024,400 tons. W. also produces rape-seed, hops, flax, and hemp. The vine is extensively cultivated. In the fifty years 1827-76 the average yield of wine was 9,645,196 gallons, valued at £411,858. Fruits are abundant, chiefly apples, pears, plums, cherries, quinces, peaches, apricots, nuts, and chestnuts. Forests (52 per cent. of coniferous trees) cover 2273 sq. miles. There were in W., in 1873, 96,970 horses, 946,228 head of cattle, 577,290 sheep, 267,350 swine, and 38,305 goats. The industries of W., which in 1875 employed 200,000 persons, consist of the manufacture of cottons (£2,000,000 worth a year), woollens and half-woollens, linens (£825,000 a year), hardware, gold, silver, copper, and brass wares, paper (7759 tons annually, worth £300,000), steam-

engines and other machinery, philosophical instruments, organs, pianos (27,000 a year), and harmoniums (the last two to the value of £150,000 annually), silks, lace, embroidery, corsets, leather and leather gloves, straw-plait, toys, chemicals, colours, gunpowder, beet-sugar, confectionery, chicory, and 'Schaumwein.' The chief imports are colonial products, southern fruits, oil, tobacco, hemp, hardware, hides, soap, cotton, coal, glass, and fancy goods. The railways of W.—all, except 11 miles, belonging to the state—covered (1877) 815 miles; telegraphs in 1874, 509 miles. The 'Evangelical Protestant Church' of W. was formed in 1823 by a union of the Lutherans and Calvinists ('Reformed'), and its direction is in the hands of six general superintendents, under the King. The Catholics are under the Bishop of Rottenburg, who acts in conjunction with a 'Kirchenrath' appointed by the Government. Education is in a very forward state. No one above the age of ten is unable to read or write. Children between the ages of seven and fourteen are obliged to attend the 'Volkschulen,' which in 1876 numbered 2500, having 3910 teachers and 350,000 scholars. For secondary education there are 70 'Latin schools,' 7 lyceums, and 9 gymnasiums, together attended (1876) by 7700 pupils; and 79 'Realschulen,' with (1876) 7607 pupils. W. is well supplied with technical and art schools, and has over 1000 industrial schools. For theological students there are 4 Protestant seminaries, and the famous 'stift' at Tübingen (q. v.), the seat of the university. There are also 3 Catholic 'Konvicte,' and a seminary at Rottenburg. W. is a constitutional and a hereditary monarchy. The legislative power is vested in the 'Landtag' of two houses —the 'Standesherren' (45 members), and the 'Abgeordneten' (93), and the executive in a privy council of six ministerial departments. The army of W. forms the 13th corps of the Imperial army (in 1878, 17,745 men). The total revenue and expenditure in 1877-78 each amounted to £2,416,939, and the public debt (1st July 1878) was £16,660,738 (£14,386,743 on railways). See *Württembergische Jahrbücher für Statistik und Landeskunde* (Stuttg. 1818 *et seq.*); Pleibel, *Handbuch der Vaterlandskunde* (2d ed. Stuttg. 1877); *Die Gemeinschaften und Sekten W.'s* (Tüb. 1877).

History.—The earliest known inhabitants of W. were the *Suevi*, among whom the Romans, after the conquest of their country about 84 A.D., founded several settlements. The Alemanni having thence expelled the Romans about the middle of the 3d c., were conquered by Hlodwig at Zülpich in 496 Under the Frankish rule the country was divided between Rheinfranken and the duchy of Schwaben, which existed till the fall of the House of Hohenstaufen in 1286. With the Graf Ulrich in 1241 begins the historic series of the grafs of *W.* Eberhard VII. was made Duke of W. in 1495. In 1520 W. came under the Hapsburg dominion, but recovered its independence in 1534 under Duke Ulrich, in whose time the Reformation began to be introduced. W. having in 1633 leagued with Sweden against the Emperor, was devastated by the imperial troops. It suffered a like treatment from the French under Melac (1688–92). Under Eberhard Ludwig (1693–1733) W. was governed by the court mistresses, and under Karl Alexander (1733–37) by the Jew Süss-Oppenheimer, but Karl Eugen's (1744–93) struggle for absolute power was wisely checked by the 'Erbvergleich' of 1770. Involved in war with France in 1796, W. was forced to yield Mömpelgard, in compensation for which Friedrich II. Wilhelm Karl received in 1803 the title of Elector, with extensive additions to his territory, called *Neu-W.* By an alliance with Napoleon on the 5th October 1805 and the 1st January 1806, the Elector became King of W., which received much further extension, and became a member of the Confederation of the Rhine. In May 1809, Ulm and Mergentheim were also added. After the battle of Leipzig W. broke with Napoleon in the Treaty of Fulda (November 1813), and joined the other German princes. King Wilhelm (1816–64), though he granted a liberal constitution (September 25, 1819), pursued in the main a policy in sympathy with Austria. Karl I., his successor, siding with Austria in 1866, was defeated at Tauberbischofsheim (24th July), and on the 13th August concluded peace with Prussia, paying eight million florins of war indemnity, and entering into an offensive and defensive alliance with Prussia. See the histories of W. by Pfister (5 vols. 1803–27), Pfaff (new ed. 3 vols. 1835–39), and Stälin (4 vols. 1841–73), the last being the most important. There is a short abstract of the history of W. by Staiger (Tüb. 1875).

Würz'burg, a town of Lower Franconia, Bavaria, Germany on the Main, 22 miles S. of Schweinfurth by rail. It is pleasantly situated chiefly on the right side of the river, which is crossed by a fine bridge 500 feet long. The chief buildings are the Royal Palace, a very splendid structure erected in 1722-44, with a large square in front of it, and extensive gardens behind. The cathedral, a Romanesque basilica, in the middle of the town, was founded in 742, rebuilt in 1042, and restored in 1852–53. The Marienkapelle (1377–1479), St. Burkhardt (1033–42), on the left bank, the Neümünster-kirche (1000), whose crypt contains the relics of St. Kilian, where Walther von der Vogelweide (q. v.) was buried, and the Renaissance Hauger-Stiftskirche (1670–91), are the finest of 32 churches. W. has a university founded by Bishop Julius in 1582, with (1878) 69 instructors and 941 students, over one-third medical, there being here an excellent hospital, the Julius Hospital, with 500 patients. The university has a library of over 100,000 volumes, and the hospital has a very extensive museum. W. was till lately fortified, but its ramparts have been converted into boulevards. The fortress of Marienberg (1650) on the hill outside the town was till 1720 the episcopal palace. It is a place of no strength, but contains a large garrison. Wines, woollens, and scientific implements are manufactured, and there is trade in corn, wine, beer, timber, &c. Pop. (1875) 44,975, of whom 7666 were Protestants and 1879 Jews. W. is historically interesting as the capital of the sovereign bishopric of W., founded in 741 when the town was already existing; Burkhardt was the first bishop; the Irish St. Kilian was the patron saint. It was besieged and destroyed in 1080 by Prince Hermann, but soon revived, and ducal rights were conferred on the bishops in 1120. Again on 7th May 1525 the Bavarians took the town, and the citadel surrendered in a month. Gustaf Adolf besieged it 18th October 1631. Secularised (1801) by the peace of Luneville, it was given to Bavaria in 1803. The last engagement of the Prussian army of the Main during the six weeks' war was the bombardment of the fortress, 27th July 1866. The see, long vacant owing to the *Cultur Kampf*, was at last filled up in May 1879. See *W. und seine Umgebungen*, by Heffner (2d ed. Würzb. 1871); *Die Herzogliche Gewalt der Bischöfe in W.* by Henner (Würzb. 1874); and *Baugeschichte Würzburgs* by Urlichs (Würzb. 1878).

Würz'zen, a town of the kingdom of Saxony, on the Mulde, 16 miles E. of Leipzig by rail. It has a cathedral, founded at the beginning of the 12th c., and two other churches, a schloss of the 15th c., flour, oil, and paper mills, and manufactures of carpets, felt, cigars, chemicals, and pottery. Pop. (1875) 8165 (almost all Protestants). W. was a city as early as 961. It was sacked and partly burnt by the Swedes in 1637.

Wy'andots, the 'Hurons' of French writers, a tribe of N. American Indians of the Iroquois stock. They originally dwelt in Canada, W. of Montreal, but were nearly exterminated in 1636. A few settled at *Ancien Lorette*, in Lower Canada, where they still remain and are called Hurons. The rest wandered about in the United States near Lake Superior, furnished 300 fighting men to England in 1812, and now occupy a reservation in Indian territory. Part of the tribe has accepted United States' citizenship, and are prospering greatly; the remainder (220 strong in 1870) are less flourishing.

Wy'andotte, a town of Kansas, U.S., at the confluence of the Missouri and Kansas rivers, opposite Kansas city, has 8 churches, a State blind asylum, 2 weekly newspapers, &c. W. is an important railway junction, and the seat of great machine-shops, stock-yards, rolling-mills, and pork and beef packing-houses. The neighbourhood is rich in coal, and the town has been lighted since 1867 by gas from a natural gas-well. Pop. (1870) 4791.

Wy'att, Richard John, an English sculptor, born in London, 3d May 1795, became a pupil of Charles Rossi, R.A., and afterwards a student of the Royal Academy, whose medal he twice carried off. W. settled at Rome in 1821, and died there 28th May 1850. He was an artist of high and refined talent, and worked with extraordinary industry. Among his best-known works are his 'Flora,' 'Nymphs,' 'Penelope,' 'Ino and the Infant Bacchus,' 'Musidora,' and 'A Shepherd Boy protecting his Sister from the Storm.' His female figures in particular are singularly happy in their combination of emotional expression and physical beauty.

Wy'att, Wyat, or **Wiat, Sir Thomas,** an English poet, born in 1503 at Allington Castle, in Kent, was the son of Sir Henry W., who about ten years later distinguished himself at the Battle of the Spurs. Having entered St. John's College, Cambridge, in 1515, he took his B.A. degree in 1518, and became M.A. in 1520. After his marriage, which also belongs to 1520, we have little trace of him till he appears as ewerer at the coronation of Anne Boleyn, who, according to a vague conjecture, had been the object of his passion. By this time he was in favour at court as a gentleman of rare endowments and attainments, well suited 'to serve his prince at all assays.' In 1537 he was knighted, and though he was imprisoned for a short time in the Tower on account of a quarrel with the Duke of Suffolk, he was soon after assured of the royal confidence by being not only made Sheriff of Kent, but commissioned as ambassador to the Emperor Karl V. in Spain. In 1539 he was employed to frustrate the coalition of France and Spain, then earnestly laboured after by Cardinal Pole. Soon after his return to England Cromwell fell, and as one of Cromwell's friends he was accused by Bonner of treasonable dealings. So conclusive, however, was his defence, that he was not only set at liberty, but the king, in token of his satisfaction, crowned him with favours and rewards. Retiring to Allington 'to walk at liberty in lusty leas, and in foul weather at his books to sit,' he doubtless looked forward to many pleasant years; but in 1542 he was called to meet an imperial embassy at Falmouth, and being exposed to bad weather on the way, fell sick at Shelbourne, where he died on the 10th or 11th of October. W.'s importance as a writer is due mainly to the fact that along with Surrey (q. v.), his younger compeer, he marks the Renaissance of English poetry. The effects of foreign culture are evident in his workmanship, and indeed a number of his pieces are free translations from the Italian; but, except in a few cases, when he is carried away by a free lyrical impulse, he has failed to catch the melody of his masters. Yet the poems are not destitute of beauty and force both of emotion and phrase. They are mainly of the amatory type, and many were certainly written before 1536. The three satires after the manner of Horace, and the version of the penitential psalms, belong to the last years of his life. His defence against Bonner is impassioned and able. W.'s works are usually associated with Surrey's. Nott's (1815–16) is probably the best edition; Gilfillan's, Bell's, and Hannah's (in *Courtly Poets*, 1870) are among the more recent. See Nott's *Life of W.*; Edward A. Bond's paper on a Wyatt MS. in *Athenæum* (1871); and Minto's *Characteristics of English Poets* (Lond. 1874).—**Sir Thomas W.**, surnamed 'the Younger,' son of the preceding, was born about 1520, served with distinction on the Continent (1544–50), but has acquired a place in history as the leader of the passionate revolt of the Kentish men (1554), when the news reached them that Queen Mary was bent on marrying Philip of Spain. W. forced his way victoriously to Southwark, but finding the bridge over the river secured, crossed at Kingston. Cut off from his followers, though he pushed on with desperate courage as far as Temple Bar, he sank exhausted at the gate, was taken prisoner, and sent to the block 11th April 1554.

Wych'erley, William, born at Clive, near Shrewsbury, about 1640, was sent to France by his father, a country gentleman, when fifteen years of age. Madame Rambouillet, among others, patronised the handsome young fellow, and her influence made him a Romanist. About the period of the Restoration W. returned to England, and while living at Oxford as a private student he became Protestant again for convenience's sake, although he died a Papist, according to Pope. He next went to London as a law-student, but, like so many clever young fellows of the period, found play-writing the occupation most productive of public encouragement. He told Pope that his *Love in a Wood* was written when he was nineteen, but it appeared only in 1672. The Duchess of Cleveland went two successive nights to see it performed, accepted its dedication, and introduced the author to court favour. Scandal says he rose to the highest point in her own. The only good action that was ever attributed to this dramatist was an endeavour to secure for the author of *Hudibras* the patronage he himself enjoyed, but he failed. Meantime the king gave him smiles and sometimes money, while Buckingham commissioned him in his own regiment. W.'s life about town was so successful that he only required to write three other plays,—*The Gentleman Dancing-Master* (1673), *The Country Wife* (1675), and *The Plain Dealer* (1677). This last is much the best of his smart, vigorous, indecent comedies. While the dramatist was in a book-shop at Tunbridge Wells the Countess of Drogheda came to ask for *The Plain Dealer*. 'There he is,' said the bookseller, pushing forward W., who eventually married the lady. While she lived he was plagued with her jealousy, and when she died, her disputed fortune only led him into law expenses, by which he was reduced to seven years of the Fleet prison. After the accession of James II. a royal pension of £200 was granted him, and the inheritance of the paternal estate restored him to the bosom of vicious London society. In 1704 he furbished up a volume of wretched *Miscellany Poems*. To spite his heir-at-law the old debauchee married a young girl eleven days before his death, 1st January 1715. His *Posthumous Works* were published in 1728. The first complete edition of W.'s works appeared at London in 1712; later editions are those of 1720, 1731, 1735, and 1768, and Leigh Hunt's (Lond. 1840; new ed. 1865). The best thing that can be said of W. is that he served as a model for Congreve and Farquhar. See Macaulay's *Essay on the Comic Dramatists of the Restoration*.

Wy'combe, High, or **Chipping,** a town of Buckinghamshire, England, on the Wye, 15 miles N. of Windsor by rail. It consists mainly of a long street; its parish church of All-Saints was built in 1273, in the Norman style, has undergone frequent alterations, and was restored in 1875. The making of chairs, lace, and strawplait are the leading industries. There are several paper-mills on the Wye. Pop. (1871) 4811. The village of West W., 2½ miles N.W., carries on the same industries, and like High W. has numerous traces of Roman occupation. The two towns form the major portion of the parliamentary borough of W., which has had one member since 1867.

Wye (Cymr. *gwy*, 'water'), a river of S. Wales, which, rising in Montgomeryshire, amid the swamps of Plinlimmon, not 2 miles from the Severn's source, and flowing generally S.E. between Radnor and Brecon, through Hereford, and between Gloucester and Monmouth, enters the Severn at Chepstow, 123 miles below its head. Rapid and rockbound as far as Hay, the W. grows gentler as it gathers volume, but throughout is singularly beautiful, making innumerable horse-shoe curves between wooded banks, and passing by Maeslough, Clifford, Goodrich, and Chepstow Castles, Hereford Cathedral, and Tintern Abbey. A pair-oar can descend from Hay, and barges ascend as high as Hereford, but a tidal-bore, whose height on 8th April 1879 was 44 feet, makes navigation dangerous at the mouth, where netting has greatly spoilt the upper salmon-fisheries. See Ritchie's *Upper W.* (Lond. 1839), illustrated by Creswick, and Howitt's *Ruined Abbeys and Castles of the W.* (Lond. 1863).

Wyke'ham, William of, was born at Wykeham, Hampshire, in the summer of 1324; his patronymic, if such indeed he had, being Longe. Of humble birth, he owed a training at Winchester high school to the liberality of Nicholas Uvedale, lord of the manor of Wykeham and constable of Winchester Castle; and having served as secretary first to that nobleman and next to Bishop Edynton of Winchester, he gained through their patronage a place about court (1348). Appointed by Edward III. clerk of the royal works (1356), he built Queenborough Castle in the Isle of Sheppy; a nobler proof of his grand powers as architect was the rebuilding of Windsor Castle, where, however, the presumptuous legend, 'Thys made Wykeham,' set up in a conspicuous place, had brought him into trouble with the king, but for the explanation that Windsor Castle was the making of *him*. Meanwhile from deacon's (1352) he rose to priest's orders in the next ten years, and received (1357) the Norfolk rectory of Pulham, first in a long series of church preferments, including a deanery, archdeaconry, and seventeen canonries. In 1359 he became chief warden and surveyor of sundry royal castles and manors, in 1363 warden of the king's forests on this side Trent, in 1364 keeper of the privy seal and secretary to Edward III. Charged with three others to negotiate the ransom of the captive David II. (1365), he was raised to the see of Winchester (1366), and within a twelvemonth created Lord High Chancellor. 'In those days,' says Froissart, 'there reigned in England a priest called W. of W., who was so much in favour with the king that everything was done by him, and nothing was done without him.' But his 'reign' was soon

clouded by the political troubles of Edward's closing years, and having in 1371 resigned both the great and the privy seals to creatures of the baronage, he was accused in 1376 of embezzlement, oppression, and other acts of misgovernment. The accusation fell through after costing him 10,000 marks; and from the restoration of his episcopal castles and reformation of the religious houses throughout his diocese, including the ancient hospital of St. Cross, W. could turn to the great object of his life—the founding of the two great colleges of New College (q. v.) and Winchester (q. v.). 'Wherein I am wanting myself,' ran his speech in 1366, 'that will I supply by a brood of more scholars than all the prelates of England ever showed;' and W. College was first of its kind, a pattern to Eton and all succeeding public schools. To study the scriptures and grammar, 'the foundation-stone, gateway, and source of all other arts and sciences,' is the main precept of W.'s wise and liberal statutes, where Wykehamists are led to esteem no man's person, but themselves to observe that courtly bearing set forth in the founder's motto, 'Manners makyth man.' New College was opened in 1386, Winchester in 1393; and W., having again been chancellor (1389-91), died at South Waltham, 27th September 1404, and was buried in his cathedral, the nave of which he was then re-building. See his Life by Bishop Lowth (new ed. Oxf. 1777), and Walcott's *W. of W. and his Colleges* (Lond. 1852).

Wynaud' (*Wainád*), a mountainous tract in the interior of the district of Malabar, Madras, British India, on the inner side of the W. Ghauts, sloping E. towards the States of Coorg and Mysore. Area, about 1190 sq. miles. For long this tract was only known as covered with primeval jungle, but in 1840 a coffee plantation was experimentally commenced. In 1862 there were nearly 10,000 acres under this crop. By 1873 the cultivation had increased to 29,595 acres, in 6913 holdings, of which 195 belong to Europeans; the total produce is estimated at 83,500 cwts. The industry is of a speculative nature; virgin land is sometimes bought at from £4 to £6 per acre, cleared at great cost, and then again suffered to go to waste, owing to a fall in prices. Labour is attracted by the high rate of wages from the neighbouring tracts, and the planters themselves only live on their estates during certain seasons. During the last few years a new form of speculation has sprung up. Gold had long been obtained from alluvial deposits, but it has now been ascertained that there are auriferous quartz reefs yielding an average proportion of 7 dwts. of gold to each ton of quartz.

Wyn'toun, Androw of, a Scottish chronicler, was born about the middle of the 14th c. He was a canon regular of the priory of St. Andrews, and in or before 1395 was elected prior of the monastery of St. Serf's Insh in Lochleven, one of the earliest religious establishments in the E. of Scotland. The date of his death is unknown. His *Orygynale Cronykil*, undertaken at the request of his friend Schyr Jhone of the Wemyss, ancestor of the Earls of Wemyss, appears from internal evidence to have been finished about 1426, and therefore belongs to the reign of James I. It is a metrical history in nine books. 'W., like most other historians of his own and the preceding ages, begins his work at the creation; and he gives a general history of the world in the first five books, with very little of Scottish or British history till the commencement of the sixth; after which he gradually drops foreign affairs, and comes home to the proper business of his undertaking.' The work is in many respects an invaluable record. It contains what must be regarded as the original account of many historical transactions, and there is evidence of an unprejudiced, impartial, and modest spirit in the author himself; but there is hardly any poetry in W.'s octosyllabics. The diction, however, has a philological if not an artistic value, and merits the careful attention of all students of the English tongue. The best MS. of the *Orygynale Cronykil* is the 'Royal' in the British Museum. In modern times the work was first brought before the notice of the public by Dr. William Nicolson, Bishop of Carlisle, in his *Scottish Historical Library* (1702). It was also described by Dr. George Mackenzie in his *Lives and Characters* (1708), but was first printed in 1795 by Mr. David Macpherson. This editor was thoroughly qualified for the task, but he chose to omit the books which did not bear on Scottish history. However valueless these might be, their suppression was a mistake, and they have been restored in Mr. Laing's version of Macpherson's edition, forming 3 vols. (Paterson, Edinb. 1872-79) of the 'Historians of Scotland.'

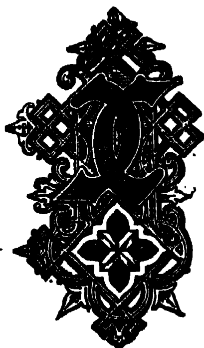
Wyo'ming, a territory of the United States N. of Utah and Colorado, and W. of Nebraska and Dakota. It is rectangular, measures 355 miles by 276, and has an area of 97,883 sq. miles. Pop. (1870) 9118 (estimated, December 1874, at 25,000). The Rocky Mountains cross the territory in a south-westerly direction, and its surface is generally mountainous. The Big Horn River flowing N. but afterwards E. to the Missouri, and the N. fork of the Plate running E. to the Mississippi, are the two largest streams, but the whole country is well supplied with water. Gold and silver are found in various places, chiefly W. of Fort Cheyenne. Iron and coal are already worked in large quantity. Copper, lead, and gypsum are known to abound. The annual rainfall is small, averaging only 11 inches. With a mean annual temperature, 44° F., the climate of W. is healthy—genial and temperate in summer, though in winter stormy and severe. The Union Pacific Railway traverses the S. part of W. for 470 miles, passing Cheyenne, the capital. Pines clothe the hills, while the elm, ash, walnut, &c., are also plentiful. Part of the territory belongs to the great American Desert and is covered with buffalo grass, but it is estimated that 5,000,000 acres are readily available for arable land and 35,000,000 for pasture. The grizzly bear, wolf, badger, elk, buffalo, antelope, mountain-sheep, and various deer, are the chief wild animals. Horses and cattle are rapidly multiplying on the farms. Grouse and other game abound, while the rivers are well stocked with trout and salmon. An immense area in the N.W. upwards of 50 miles square is reserved as the Yellowstone National Park (see UNITED STATES). In regard to a district changing so rapidly as W., statistics have little value. In 1874 it was estimated that upwards of $500,000 worth of cattle were sent from W. to Chicago. In that year the territory contained 14 schools. In 1875 there were 17 churches and 10 newspapers—3 were published daily. The first settlement was made in 1836, and W. was organised as a territory in 1868. Cheyenne, the capital, had an estimated pop. of 2500 in 1874, but is rapidly growing. See *North-Western W., including Yellowstone National Bank*, by W. A. Jones, Captain U.S.A. (Wash. 1873; Lond. Trübner).

Wyo'ming (Ind. 'great plain'), the name of a valley on the W. branch of the Susquehanna, Pennsylvania, U.S., 21 miles long by 3 broad, and closed in by lofty cliffs. It was always noted for fertility, and latterly rich coal-seams have been found in it. On 30th June 1778, 400 British troops, 700 Seneca Indians, and a few 'Tories,' *i.e.*, American royalists, under Colonel John Butler, invaded the valley, and only 300—mostly lads and old men—could be mustered by Colonel Zabulon Butler to defend the place. The battle of W.—fought on July 3d—ended in the defeat of the latter, and was followed by great cruelties. Campbell's *Gertrude of Wyoming* is in many respects grossly inaccurate, his knowledge having been derived chiefly from vague rumours. A monument at Kingston commemorates those who fell in the battle of W. See C. Miness, *History of W.* (1845), and George Peck's *W., its History and Incidents, &c.* (New York 1858).

Wyr'cestre, William, son of a Bristol burgess of the same name, was born in that city in 1415, entered Hart Hall (now Balliol College), Oxford, in 1432, where he remained four years, and afterwards became secretary and pursuivant to Sir John Fastolf, in commemoration of whose exploits he wrote the *Acta Domini Johannis Fastolf*, which Bale had seen and quotes, but which is now lost. He was one of Fastolf's executors, and the administration of the will brought him into controversy with Sir John Paston and others. The dispute was not settled till 1472. In 1473 he presented his friend, Bishop Waynflete, with a copy of an English version which he had made of Cicero's *De Senectute*, and which was published anonymously by Caxton. He died in Bristol about 1479. The twin passions of his life were literature and architecture. His chief works are the *Itineraria* (edited by Nasmith, 1778), and the *Annales Rerum Anglicarum, 1324-1468* (edited by Hearne, 1771). The *Saturday Review* (January 18, 1879), in an interesting notice of W., says that if Leland is the father, W. is the forefather of English antiquaries. 'The numerous waifs and strays of hagiology, biography, and folk-lore, as well as of topography and contemporary history, that are to be found only in W., commend his unpretending books to more attention from the student of mediæval history than they have received.'

Wytt'enbach, Daniel Albert, born 7th August 1746 at Bern, studied at Marburg, Göttingen, and Leyden, and was successively professor of Greek at the Remonstrants' College at Amsterdam (1771), of philosophy at the Athenæum there (1779), and of eloquence at the University of Leyden (1799). Retiring in 1816, he resided first at Heidelberg, then at Leyden, and died at Œsgeest, 17th January 1820. W.'s writings are full of sound classical learning and criticism, expressed in pure and clear Latin. The chief are *Epistola Critica ad D. Ruhnkenium* (Gött. 1769); *Præcepta Philosophiæ Logicæ* (Amst. 1782; new ed. by Maas, Halle 1821); *Vita Ruhnkenii* (Leid. 1800; last ed. by Frotscher, Freiburg 1846); the *Bibliotheca Critica* (3 vols. Amst. 1777-1808); the *Philomathia seu Miscellanea Doctrina* (3 vols. Amst. 1809-17); his editions of Plato's *Phædo* (Leid. 1810, Leip. 1825) and Plutarch's *Moralia* (5 vols. Oxf. 1795-1800), and the *Animadversiones* (3 vols. Oxf. 1810-21). A collection of his *Opuscula Varii Argumenti* appeared after his death (2 vols. Leid. 1821); selections by Friedemann (Brunsw. 1825), as also of his *Index Græcitatis* (2 vols. Oxf. 1830), and his letters, *Epistolarum Selectarum Fasciculi Tres* (edited by Mahne, Ghent 1830). See Mahne, *Vita D. Wyttenbachii* (Ghent 1823).—**Johanna W.** (*née* **Gallien**), married to the above in his seventy-second year, lived after her husband's death chiefly in Paris, obtained the degree of doctor of philosophy from Marburg University in 1827, and died at Leiden in 1830. Of her writings the chief are *Théagène* (Par. 1815); *Das Gastmahl des Leontis* (Ulm 1821), and the novel *Alexis* (Par. 1823).

X.



The twenty-fourth letter of the English alphabet. It is a double consonant, compounded with *s* and one of the gutturals. It first appears in the Greek alphabet at a comparatively late period, and thence it came into Latin. When used as an initial it generally betrays a Greek origin. It almost universally represents a guttural, but sometimes another letter compounded with *s*, as Lat. *nix* 'snow' from root *niv*; *proximus* 'nearest,' from root *prop*. Sometimes again it stands for simple *s*, as Gr. *sun* and *xun*; Lat. *Ajax*, Gr. *Aias*. In Spanish it is pronounced as a guttural aspirate; *cf. xeres* 'sherry.' As a numeral X stands for ten, perhaps as representing a V standing upon a second V inverted. In Latin it was a common symbol for *denarius*. As an algebraic symbol it is used to represent the unknown quantity to be determined.

Xan'thein, a name given by Fremy and Cloez to one of the three colouring principles discovered by them in flowers, the other two being called *Xanthin* and *Cyanin*. X. and xanthin are yellow, soluble and insoluble in water respectively, and cyanin is blue in colour.

Xan'thine ($C_5H_4N_4O_2$), a natural base present in nearly every part of the animal organism, and in minute quantities in urine. It was first described under the name of xanthic oxide by Marcet, who discovered it in urinary calculi. It may be prepared with great facility from Guanine (q. v.) by treating that substance with nitric acid. This action gives rise to X. and another substance, nitroxanthine, which by the action of reducing agents is reduced to X. also. X. is a white, amorphous powder, hardly soluble in water, but forming with acids crystalline compounds. It dissolves in nitric acid without evolution of gases, and also dissolves readily in ammonia and potash. When evaporated from solution in nitric acid there is left behind a deep yellow characteristic precipitate.

Xanthox'ylon, or Zanthox'ylum, a large genus of *Rutaceæ* representative of the tribe *Xanthoxyleæ*. The species have a wide geographical range, and they differ much in habit, some being trees, while others are erect or climbing shrubs. The fruits of most have an aromatic pungent taste like pepper. In the United States the bark of *X. fraxineum* (toothache shrub or prickly ash) is used as a permanent arterial stimulant, and as an alterative in syphilis and rheumatism; and in the W. Indies that of *X. clava-Herculis* is used for malignant ulcers, and is employed both externally and internally as an alterative in syphilis. Its stem is valued for walking-sticks, and the beautiful close-grained wood serves for inlaid work, &c. The fruit of *X. alatum* of India is used as a remedy for toothache, and as a condiment, and when bruised is put into foul water to purify it; the bark has the power of intoxicating fish.

Xan'thus, the ancient capital of Lycia (q. v.), was situated in the fertile plain of the river X., on its left bank, and 6 miles above its mouth. Twice destroyed, by the Persians under Harpagus in 546, and by the Romans under Brutus in 43 B.C., it never recovered from the latter blow; but its ruins, near the village of Kounik, remain to attest its former grandeur. Cyclopean in their character, these comprise a theatre, temples, and rock-cut tombs, and were first explored by Sir Charles Fellows (q. v.) in 1838-42. The Zendic inscriptions of the monuments, first deciphered by Grotefend, have most recently been discussed in Schmidt's *Lykische Inschriften* (Jena 1868).

Xantipp'e, wife of Socrates, is the typical female termagant or scold. Most of the stories about her are probably false; for in ancient Athens gossip was cultivated to the perfection of a fine art, and the *point* and not the *truth* of the story was the chief consideration. X. had probably some little acerbities of temper, and these must have been heightened by the peculiarities of her spouse, especially his indifference to the commonplace duty laid upon the head of the house to make both ends meet. Socrates received her reproaches with such good-humoured indifference that we cannot wonder she sometimes resorted to other weapons beside her tongue; as on the occasion when she is said to have finished up a tirade by sousing the philosopher, though his remark, as he moved dripping from the scene, that when X. thundered she watered, must have convinced her that here too she was powerless. Some authors have given Socrates a second wife, entitled Myrto, but the story is undoubtedly false. In our own day, Zeller has given X. an elaborate whitewashing (*Vorträge und Abhandlungen*, 2d ed. Leip. 1875); but the opinion of mankind will, we are afraid, still be that of the Old English writer who calls her 'a passing shrewde, curste, and wayward woman, wife to the pacient and wise philosopher Socrates.'

Xavier, Francisco (the modern Spanish spelling of the name is Javier, and the pronunciation Havier), a missionary and saint of the Roman Catholic Church, usually styled the Apostle of the Indies. He was a native of Northern Spain, being the son of a nobleman whose family seat of Xavier lay to the N.W. of Pampeluna. The date of his birth is probably 1497, and not as it is frequently given, 1506. At the College of Sainte Barbe, in Paris, he attained while still young some importance as a lecturer on philosophy; but a friendship which he formed with his fellow-countryman Loyola turned his attention in a new direction, and he became one of the first members of the Society of Jesus. In the early part of 1540, before the society had received papal approbation, he was chosen for the mission to India, and received the title of apostolic nuncio from Paul III. The rest of his life was consecrated with high-souled devotion to the work of an evangelist. From Goa, his headquarters, where he arrived in May 1542, he extended his labours southwards to Ceylon, Malacca, and Celebes. The last two years of his life were spent in Japan, where he met with remarkable success, and he was on his way to China when he fell ill with fever, and was abandoned to his fate on the island of Sancian by the shipmen with whom he sailed. He expired on the 2d December 1552. His body was conveyed to Goa, where it still remains without corruption in the church of the Bom Jesus. Once in a century it is shown to the people on the saint's day, the 3d of December. The last occasion was in 1878. X. was canonised in 1619, and in 1747 Benedict XIV. declared him the Protector of India. His letters are printed in Bartolus, *Historia gestorum per Jesuitas in Asia* (Rome 1665). See besides the works of Tursellinus (Antw. 1598), and Bouhours (Par. 1621); Verne, *Life of Francis X.* (Lond. 1863); Coleridge, *Life and Letters of X.* (2 vols. Lond. 1872-73); De Vos, *Leben und Briefe des heiligen F. X.* (2 vols. Regenb. 1877); J. M. Macanaz in *Revista de la Universidad de Madrid* (1874); Isabella Burton, *A. E. I., Arabia, Egypt, India* (Lond. 1879); and *The Graphic* (March 22, 1879).

Xe'bec (Fr. *chebec*, Port. *xabeco*, from Turk. *sumbeki*), a small three-masted vessel used in the Mediterranean Sea. It is rigged either with square or lateen sails. Xebecs carrying from sixteen to twenty-four guns were formerly used by Algerian pirates.

Xe'nia, a town of Ohio, U.S., 65 miles N.E. of Cincinnati, is an important railway junction, and has 13 churches, a fine court-house and city building, 3 newspapers, and numerous edu-

cational institutions, including a Methodist Episcopal College (1850), with 230 students (1876). In its neighbourhood are the Ohio Soldiers' and Sailors' Orphanage (1870), a county infirmary, and the Wilberforce University (1863). X. has large manufacturing establishments. Pop. (1870) 6377.

Xenoc'rates, a Grecian philosopher, born at Chalcedon, B.C. 395, was one of the followers of Plato, and *Scholarch* or chief director of the Old Academy (339-314), as the first development of Plato's school was called. 'The one' and the 'Indefinite Duad' he affirmed to be the basis of existence. The soul was 'self-moving number,' and happiness resulted 'from the possession of the virtue proper to use and of power devoted to its service.' These definitions and principles show that X. built up his philosophy by piecing together fragments from the systems of his predecessors. See Wynpersse, *Diatrebe de Xenocrate Chalcedonis* (Leyden, 1822), and Ueberweg, *Geschichte der Philosophie* (Eng. trans. by Morris, 1874).

Xenoph'anes, the founder of the Eleatic School of Philosophy, was born at Colophon about 569 B.C., and wandered as a Rhapsodist through Greece. He lived to a great age, though the exact period of his death is uncertain. In direct contrast to his philosophical predecessors on the one hand, and to the popular beliefs on the other, he held the doctrine of the Unity of Being. The 'One' alone exists, and this one he called God. He did not attempt to explain the contradictions to which the theory of Unity gave rise, and for the complete development of his philosophy we must look to his successor Parmenides (q. v.). See the Histories of Philosophy by Schwegler, Ueberweg, and Lewes.

Xen'ophon, one of the best known of the Greek class of authors, was born at Athens about 444 B.C. His father, Gryllus, was a man of position, and consequently X. received a good education. He was one of the pupils of Socrates, and this was of itself the highest sort of training a man could have. When about forty he joined the expedition of Cyrus against Artaxerxes. On his return he settled at a charming retreat at Scillus in Eleia, and gave himself up to literature and the sports peculiar to a country life. These sports he seems to have followed and described with equal relish. He died either at Scillus or at Corinth about 357. X. wrote a considerable number of works, and all of these, it would seem, have come down to us. The chief are— the *Anabasis*, in 7 books, which relates the expedition of Cyrus already referred to. It falls conveniently into three parts. The first relates how Cyrus invaded the Persian dominions of his brother Artaxerxes, and how he lost his life at the battle of Cunaxa (401); the second is an account of the retreat of the Greek contingent, 10,000 strong, through an hostile and unknown country, and in the presence of difficulties of all sorts, to the Euxine. X. was chosen one of the leaders to conduct the retreat, and this he managed, according to his own account, with a happy combination of prudence, courage, and skill; the third part tells the subsequent adventures of the contingent. The *Memorabilia* is a record, in 4 books, of the life and teaching of Socrates. This is for us by far the most important work of X. In it he defends his master from the charges brought against him by showing in a plain matter-of-fact way that he did *not* corrupt the youth, and that he *did* sacrifice to the state divinities. A great number of conversations and incidents in the life of Socrates are described with considerable minuteness; but we miss in the account some of the most remarkable characteristics of the great philosopher. The delicate irony, the rich humour, the subtle play of thought, are absent, or shine with but feeble lustre, in X.'s narrative. Still the work is very valuable, for (1) any scrap of information about Socrates is valuable, (2) and this account seems quite accurate, as far as it goes, (3) it enables us to 'check' the Platonic picture which otherwise would have seemed like so many other Platonic ideals, a dream never to be realised in this life. Along with the *Memorabilia*, the *Apology* and *Symposium* must be taken. The one is the speech of Socrates before his judges, the other is a picture of a classic feast, at which Socrates is one of the chief characters. They are among the most pleasing of the works of X., but unfortunately Plato has two dialogues of the same name, which are so far beyond them as works of art that they have quite eclipsed them. The other works of X. need not detain us long. The *Hellenica* in 7 books gives us a somewhat dull and dry account of forty-eight years of Grecian history. It is a continuation of Thucydides (q. v.), and terminates B.C. 362. The *Cyropædia* in 8 books is a fictitious biography of Cyrus of Persia (not the Cyrus mentioned in the *Anabasis*). It is merely a political romance in which historical propriety is not observed, for the whole surroundings are thoroughly non-Persian. It has been well said of its purpose that 'a combination of the teachings of Socrates with the institutions of Sparta is what X. wishes to recommend under the shallow disguise of Persian names and the picture of a foreign court.' The *Agesilaus* is a somewhat exaggerated panegyric on the Spartan tyrant of that name. The *Revenues of Athens*, the treatises on the *Spartan and Athenian States* are works on economy and politics based on perfectly outrageous principles which we can only pardon when we remember that Aristotle had not yet written. The *Hiero* is a dialogue on the advantages and disadvantages of a kingly station. In the *Hipparcus*, a treatise on the duties of a commander of cavalry, in the *Horse*, a dissertation on ancient jockeyship, and in the *Cynegeticus*, a discourse on hunting, as well as in the *Œconomics* on household management, the practical X. is quite at home; nowhere is he more entertaining or more sensible, and nowhere does he appear to better advantage. Of X. generally it may be said, that of all the classic writers he is the most commonplace. He had considerable experience, and his remarks on men and manners are no doubt true, but they are only skin deep. He was a plain blunt soldier with a very 'flat' turn of mind. A great hero-worshipper, too, though not a very discriminating one, since characters so different as Socrates, the younger Cyrus, and Agesilaus were alike the objects of his laudation. Quite a man of the world, he is yet not at all of a sceptical disposition. He carefully consulted the oracles on doubtful occasions, though he generally took very material means to make the response 'square' with his preconceived intentions. Why after all this does he occupy the place he does in the literature of the world? Many reasons might be given, and these would naturally be the record of his merits. He was a man of strong, though not of great, mind. He is sensible, lively, and natural; moreover, he is one of our best sources of information regarding some of the most important events that have ever happened and the greatest people the world has ever seen. His style is a model of the purest Attic Greek. The first collected edition of X.'s works with a preface by Ph. Melanchthon was published in 1540. Of later editions the best are by Schneider (6 vols. Leip. 1825-49), Bornemann, Kühner, and Breitenbach (4 vols. Gotha and Erfurt, 1828-54), and Dindorf (Par. 1839). Of the translation of separate works that of the *Memorabilia* by Levien in the 'Bayard Series,' and that of the *Economics*, with introduction by Ruskin, forming the first volume of the *Bibliotheca Pastorum*, merit special mention. For notices of the Life of X. see Krüger, *De Xenophontis Vita Quæstiones Criticæ* (Halle 1822). In the study of X., Sturz's *Lexicon Xenophonteum* (4 vols. Leip. 1801-4) and Dodwell's *Chronologia Xenophontea* will be found useful. A popular account is given by Sir Alexander Grant in his *X.* (Edin. 1871) in Blackwood's 'Ancient Classics for English Readers.'

Xeres de la Frontera, a town in the province of Cadiz, Spain, on the Guadalete, 27 miles N.N.E. of Cadiz by rail. It is a well-built, active, and growing town, with good churches and schools, a theatre, and a great arena for bull-fights. Cloth and leather are manufactured; corn, wool, and wine are exported. Wine is the staple. The hills around are clothed with vines. Of the 4,541,076 imperial gallons of sherry (named from this town) which X. exported in 1877, 3,968,028 went to British ports and colonies. Pop. (*Almanach de Gotha* 1879) 52,158. The *Asta Regia* of the Romans, X. was the scene of a great battle, 19th July 711, between the Gothic King Roderick and Tarik the Saracen.

Xeres de los Caballeros, a town of Spain, province of Badajos, on the Ardila, 40 miles S. of Badajos. It is picturesquely situated at the foot of the Sierra Morena, well built, and partially surrounded by old Moorish walls. X. has numerous churches and convents, woollen manufactures, and trade in agricultural produce. Pop. 8000.

Xeroder'ma. See FISH-SKIN DISEASE.

Xerx'es, a celebrated Persian king, who ruled from B.C. 485 to 465, was the son of Darius, and immediately on his accession prepared to carry out the invasion of Greece, the preparations for which had been begun by his father. These preparations were on the most enormous scale. Provisions were stored up

on the intended route for three years previously, an enormous transport fleet was collected, the engineering skill of the day was exerted to remove land obstacles, and the resources of the vast Persian empire were taxed to the utmost to produce an armament sufficient (it was thought) utterly to crush Greece. According to the computation of Herodotus, the invading army consisted of over two and a half million combatants and at least as many non-combatants; and although this, of course, is a huge exaggeration, we must hold it to have been the (numerically) greatest army on record. At the head of his enormous host X. advanced unopposed till he came to Thermopylæ; but here his fleet was seriously damaged by a storm, while the passage of the narrow pass was effectually prevented by Leonidas, at the head of a determined though small band of Spartans. At last the passage was effected through treachery, and X. marched on through Phocis and Bœotia to Athens, which he entered without opposition. In the meantime the Persian fleet had met with several mishaps. In two engagements with the Greek ships at Artemisium it had suffered considerable damage, and a storm which happened between the two conflicts was the cause of still greater loss. Finally, at Salamis (480 B.C.) was fought a naval battle, one of the most decisive in the history of the world. The Persians were defeated with terrible loss, and X., who from a lofty eminence had watched the destruction of his fleet, gave up the command of the invading army to Mardonius, and fled panic-stricken to Sardis. He spent the rest of his life in inglorious obscurity, and was finally murdered by Artabanus, the commander of his body-guard, who was plotting to make himself king of Persia.

Xim'enes, Gonsa'lez, afterwards **Francis'cus de Cisneros,** Spanish cardinal and statesman, was born of a noble though poor family, at the little town of Tordelaguna in 1436. He studied at the University of Salamanca, where he took the degree of bachelor both of civil and canon law. In 1455 he went to Rome, where he pled the cause of his countrymen in the consistorial courts with such success that he attracted the attention of the then pontiff. He returned in 1461 with an *expective*, which gave him a right to the first ecclesiastical preferment in a certain see that should fall vacant. A suitable office did fall vacant in 1473, but Carillo, Archbishop of Toledo, wished to fill it with a creature of his own. X. refused to surrender his rights, whereupon the enraged prelate shut him up in prison for six years. X. refused to yield, and at last attained his rights. Preferments of one kind and another followed; but X. finally determined to leave the ranks of the secular for those of the regular clergy. He became a Franciscan, one of the straitest of sects. But in vain he attempted to escape from the world. He was appointed guardian of the convent of Salzeda, in 1492 chaplain to Queen Isabella, and in 1495 Archbishop of Toledo. He was now an old man of sixty, but more than a lifetime's work lay before him. He engaged in important civil and clerical reforms, and these his determined energy enabled him to carry through in the face of much opposition. He founded the University of Alcala (1500), endowed it magnificently, and made provision therein for the encouragement of every liberal art. He collected a body of learned men and a vast number of important manuscripts, and with such aid he compiled the famous polyglot Bible known as the *Complutensian Polyglot*, a work which took fifteen years, and cost a vast sum of money. He projected also an edition of Aristotle, but this his manifold labours did not allow him to complete. He violently converted a large number of the 'infidels' of Grenada to the 'true faith,' and he carried on a victorious campaign against the Moors of N. Africa. On 17th May 1507 he was appointed cardinal, and when Ferdinand died in 1516 he ruled as regent for the young Carlos (afterwards known as Karl V.) the whole of Spain. Here his prudent care disarmed the hostility of Ferdinand, the younger brother of Carlos (a youth whose pretensions to the crown were favoured by many of the people), reconciled a discontented nobility, filled the royal treasury, and maintained the army and navy in a high state of efficiency. His regency lasted about two years. Then Carlos left the Netherlands for Spain. Almost his first act of sovereignty was the dismissal of the faithful regent. X. was already on his deathbed, and it is doubtful if he ever knew of the act of the king. He died at Toledo, 8th November 1517. X. lived not for himself but for his country, and still more for his Church. Without selfish motives or loose passions, he was worthy to be a prelate of imperial Rome and a statesman of imperial Spain. Whilst clad in the almost royal purple of a cardinal, he still wore, beneath, the coarse mean robe of his order; and this was a fit type of his life, for whilst the one prefigured his vast power, the other still more aptly signified the life-long martyrdom of a soul that longed to be free; a martyrdom, historians tell us, that showed itself in the lines of a noble face furrowed with care and sorrow. See Prescott's *Ferdinand and Isabella*; *De Rebus Gestis a X. libri octo, auctore Alvaro Gomecio*; Robles' *Vida y Hazañas del Card. X.* (Toledo 1604); and Fléchier, *Hist. du Card. X.* (Paris 1631). There is an English life by Barret (London 1813).

Xin'gu, a large river of Brazil, rises in the eastern spurs of the Serra Diamantina, near the heart of the country, and after flowing N. and N.E. for fully 1300 miles through a fertile but undeveloped region, joins the Amazon 210 miles W. of Para (q. v.).

Xiphosu'ra, an order of *Crustacea* (q. v.) represented solely by the king crabs or *Limuli*, found in the West Indian seas, and also in the East Archipelago. The front segments of the body are united to form a broad shield-like plate or *carapace* of convex shape, whilst the posterior portion is elongated to form a terminal, sword-like, spinous tail (*telson*), from the presence of which the name X., or 'sword-tailed,' has been given. On the upper and convex surface of the 'carapace' are placed the eyes, whilst the concave or under surface bears the locomotive and other appendages. In the Limulus there are thirteen pairs of appendages, and of these, six pairs, in the form of legs, are attached round the margin of the oral aperture, the spines with which the basal or proximal joints of the legs are furnished subserving the function of a masticatory apparatus. Anteriorly, and in front of the mouth, a pair of chelate antennæ are also situated. The remaining feet are placed posteriorly on the abdominal surface in the form of broad plate-like structures, to which the respiratory organs are attached. The extinct group of the *Eurypterida* were closely related to the X. The two genera, *Pterygotus* and *Eurypterus*, are included in this group, the most familiar form being that of the *Pterygotus Anglicus*. Like the *Trilobites*, the *Eurypterida* are solely characteristic of the Palæozoic life-period.

Xylene', or **Xylol'** (C_8H_{10}), one of the aromatic hydrocarbons, being a homologue of benzene (C_6H_6), and sometimes known as dimethyl-benzene from the supposition that it is formed from benzene by the substitution of two molecules of methyl (CH_3) for two hydrogen atoms. It is a colourless liquid, boiling at 140° C. When passed through a red-hot tube, X. is resolved into a mixture of several homologous hydrocarbons, the composition of which is of the type C_nH_{2n-6}.

Xylo'bius (Gr. *xylon*, 'wood,' and *bios*, 'life'), a fossil genus of *Myriapoda* (q. v.) occurring in rocks of Carboniferous age, within the hollowed trunks of *Sigillaria*, one of the most characteristic trees of the Coal Epoch. X. had the power of rolling itself up for protection into a ball-shaped form.

Xyloï'din ($C_6H_9(NO_2)O_5$), a dry white tasteless substance, into which starch is changed when treated with nitric acid. Chemically considered, it is a substitution product in which one hydrogen atom is replaced by the radical nitryle (NO_2). It is insoluble in water, but dissolves freely in dilute nitric acid. In composition and method of formation it resembles Pyroxiline (q. v.), the active constituent of gun-cotton.

Xyloph'aga (Gr. 'wood-eaters'), the name applied (1) to a group of beetles resembling the weevils, but destitute of a beak, and noted for their habit of excavating wood; (2) to a family of Diptera or flies, of which the chief genus is *Xylophagus*. In this group the antennæ are ten-jointed, and there is a long ovipositor. The larva is cylindrical, and has a scaly plate on the tail, the head ending in an acute point.

Y.



The twenty-fifth letter of the English alphabet, and like W. both a consonant and a vowel. Its form is derived from the Greek Υ, and it is first found at a late date in the Latin alphabet to transliterate the sound of U, which vowel had come to be pronounced almost the same as I. *Cf.* Odusseus = Ulysses. Its vowel use in English is merely a superfluous substitute for I, especially at the end of a word, as 'glory' from Lat. *gloria.* Its consonantal sound is properly a softened form of J, which letter in German is pronounced like our Y: *Cf.* Lat. *jugum* = Ger. *joch*, 'yoke;' hyacinth = *jacinth.* In Middle and Modern English it often represents an Old English G; *e.g.*, 'young' = Old Eng. 'geong;' 'year' = Old Eng. 'gear.' The participial prefix 'ge,' common to German and Old English, passed in Middle English into Y.—*e.g.*, 'For he was late *ycome* (Old Eng. *gecumen*) from his viage' (Chaucer, Prol. to *Canterbury Tales*). This transition shows the close connection between the vowel and consonantal sounds of the letter.

Yablonoi' Mountains. See SIBERIA.

Yacht (Dutch *jagt*, 'a light chasing ship,' from *jagten*, 'to chase') **and Yacht'ing.** A yacht is a light swift-sailing vessel, elegantly fitted up for pleasure-trips or racing. State pleasure-boats of the 17th c. were called 'yachts.' In 1720, 'The Water Club,' the parent of British yachting clubs, was founded at Cork, and it still exists as the 'Royal Cork Yachting Club.' Yachting made little progress for a century. In 1801 there were probably not more than 20 yachts owned by private individuals in Great Britain. Now (1879) the British yacht navy comprehends upwards of 2000 vessels from 3 to 600 tons or thereby. 1400 yachts exceed 10 tons, the average tonnage being 45 tons. They are classed according to their rig as schooners, cutters, and yawls, the first being the largest. Sailing efficiency is sometimes supplemented by steam-power, and the tonnage of these steam-yachts often exceeds that of the largest sailing-yachts. Next in point of age to the 'Royal Cork Club' ranks the renowned 'Royal Yacht Squadron,' which was founded (as 'The Yacht Club') at Cowes in 1815 by fifty yachtsmen. The 'Royal Thames Yacht Club' dates from 1823, and the 'London Yacht Club' (originally the 'Arundel Yacht Club') from 1838. There are now upwards of 50 clubs, more than one-half bearing the title 'Royal,' established around the British coasts, and every season they hold regattas, which are made the occasion of local fêting. These clubs form a splendid nursery for daring seamen, and they accordingly receive encouragement from the Admiralty. Among other privileges, they are allowed to refit and revictual in royal dockyards, and to use the ensign of the royal navy in addition to a distinctive club flag. Yachting is likewise cultivated in many foreign countries, especially in the United States, where racing-yachts have been brought to a high pitch of perfection. Early British yachts were constructed on the plan of the revenue cutters of the period, but gradually the heavy build was abandoned and lighter scantlings used. In 1851 the celebrated schooner-yacht *America* (210 tons), constructed by Steers of New York, appeared in British waters, and carried off the best prizes of the season, including 'The Queen's Cup' at Cowes Regatta. Her success was correctly attributed to her peculiar build and the splendid cut of her sails, which were made of cotton instead of flax. Racing-yachts then became the rage, and English yacht-builders constructed them after the general plan of the *America*, adopting her shallow keel, fine lines fore and aft, and light frame. Through fastenings were also dispensed with at the risk of weakness; the flooring was altered to give increased space for carrying a large quantity of ballast on any given displacement, and the increased stability arising from this change enabled a larger area of canvas to be carried. Strength and durability have been in a great measure sacrificed to the exigencies of yacht-racing, and the need for supervising the construction of yachts has of late years become pressing. Accordingly in 1878, Lloyd's society formed a 'Yacht Register,' and issued a set of rules for the construction, equipment, and classing of wood, composite, and iron yachts, on the plan of supervision organised for the merchant navy. Since 1851 there have been several interesting Anglo-American yachting matches, in most of which the American yachts maintained their superiority. In May 1870 the famous American schooner-yacht *Sappho*, 394 tons, defeated the splendid English schooner yacht *Cambria*, 188 tons, in three matches in the English Channel—two to windward and one over a triangular course. In the following July (4th to 27th) victory attended the *Cambria* in an ocean race from Daunts' Rock, S. of Ireland, to New York, which destination she reached 1½ hours in advance of her larger opponent, the American schooner yacht *Dauntless.* While in America, the *Cambria* endeavoured at the regatta of the New York Yachting Club to wrest the 'Queen's Cup' won at Cowes in 1851, but failed. An important trans-Atlantic race took place in December 1866 between three American schooner yachts, the *Henrietta*, 201 tons, *Fleetwing*, 205 tons, and the *Vesta*, 212 tons, and was won by the first-named vessel by a few hours. The voyage occupied only fourteen days. The love of adventure leads British yachtsmen to undertake voyages of no ordinary character, as circumnavigating the world (recently performed by Mr. Brassey in the *Sunbeam*), or penetrating the Arctic regions.

Yak (*Bos* or *Poephagus grunniens*), a species of Bovidæ or Oxen, inhabiting Tibet and the higher plateaus of the Himalayas. There are several varieties, which have been produced through the domestication of the animal. The appearance of the Y. is highly characteristic. Its shoulders are markedly humped, the rump is low, and the legs short. The shoulders are provided with a massive 'mane,' and the tail is extremely bushy. The breast is also provided with a large hairy tuft. The colour is usually black, and the animal attains the size of an ordinary ox. The specific name *grunniens* was given from the low grunting sound which the animal emits. The milk of the Y. is rich and plentiful, the flesh is highly valued, and from the hair several kinds of cloths and fabrics are made. The tail, mounted in silver, is used as a *chowrie* or fly-flapper in India. Of the varieties the noble Y. is the largest breed, the plough Y. being smaller and more docile. The animal may be crossed with domestic cattle. The Y. is employed as a beast of burden, and traverses mountainous districts with great ease. The horns are curved somewhat sharply upwards, and when irritated, the animal uses them as a means of offence. The calves do not develop the characteristic hairy covering until they are three months old or more, and their flesh is especially tender and palatable. The Y. has been domesticated for centuries in Central Asia, and the khans and lamas of Tibet measure their wealth by the number of their Y. flocks.

Yakutsk'. See JAKUTSK.

Yak'ub Beg, surnamed *Khushbegi* ('lord of the family'), and *Atalik Ghazi* ('victorious guardian'), was born near Samarcand early in the present century. His lineage and race are doubtful, but he originally appears as chamberlain to Khudayar Khan, the Mohammedan conqueror of Khokand, then a Chinese possession.

He became successively a commander of five hundred soldiers, governor of the Ak Musjid ('White Mosque'), on the Jaxartes, where in 1853 he stubbornly resisted the advance of the Russian general Perovsky, and governor of Kurama. At this time Y. B. had the reputation of being a brave soldier, an orthodox Mohammedan, and a stern disciplinarian. But he first rose to great eminence after the recovery of Kashgar from the Chinese in 1864. In the course of three years he had firmly established his power. For twelve years this remarkable man conferred on a large part of Central Asia the benefits of a settled though rigorous government. He 'drilled and disciplined a large civil staff. He presented to his subjects the spectacle about which Indian administrators now and then dream, of a monarch who held a public durbar to which the meanest had access, who received all kinds of petitions, who passed orders by a sort of instinct on piles of reports, who punished delinquent officials for malpractices, who whipped vagrants and beggars, drove idlers to say their prayers at mosques, checked sedition, and forced women to go about in modest veils' (*Saturday Review*, January 11, 1879). In his foreign policy he was strongly anti-Russian, and ultimately friendly to Britain. In 1874 a commercial treaty was concluded between Y. B. and Sir Douglas Forsyth to develop intercourse between India and Kashgar, which has already (see YARKAND) produced considerable results. But in the spring of 1877 he was assassinated, though another account attributes his death to fever, and the fabric he had so laboriously raised fell to pieces almost immediately. The Chinese armies overran the country (1878), and Kashgar has again come under Chinese rule. See Demetrius Charles Boulger's *Life of Yacoob Beg, Ameer of Kashgar* (Lond. 1878).

Yak'ub Khan, Mahomed, Ameer of Afghanistan, is the eldest surviving son of Shere Ali (q. v.) by the daughter of a Momund chief, and was born about 1848. He was nominated heir to the throne of Cabul in 1864. Appointed governor of Herat, he became extremely popular, and succeeded in maintaining his father's authority in that province when the rest of Afghanistan passed under the rule of the rival Ameers, Afzul and Azim. It was owing to his admirable generalship that Shere Ali regained his throne in 1868, and when the latter visited India in the following year Y. K. was appointed governor of the capital. In 1870 he was made governor of Candahar, and afterwards was sent a second time to Herat, where, however, his great influence excited the fears and suspicions of Shere Ali, who now declared his youngest son, Abdullah Jan, to be his heir, and sought to prejudice the British Government against Y. K., by falsely representing him as hostile to British interests. Captain Marsh, who visited him at Herat in 1872, found him exactly the reverse. In 1873 Shere Ali recalled him from Herat, Y. K. declined to return, and for a year was practically in revolt. At length, under the most sacred pledges of safety, he proceeded to Cabul, but was treacherously imprisoned, and was only released when the flight of his father before the victorious advance of the British arms in the War of 1878 made his presence indispensable to prevent anarchy in the capital and the State. On the death of Shere Ali he succeeded to the throne, and on the 30th May 1879 concluded a Treaty of Peace with the British. Shortly after the murder of Cavagnari in the following September, he fled to the army that General Roberts hurried forward to punish the Cabul assassins, and is detained a prisoner by the Indian Government.

Yale College, at New Haven, Connecticut, U.S., was chartered by the General Assembly of Connecticut in 1701, and next year a commencement was made at Saybrook. It was removed to New Haven in 1716, and two years after, in recognition of the benefactions of Elihu Yale, a Londoner, took its present name of Yale College. A new charter was granted in 1745, and further alterations were made in 1871. The college is governed by trustees, who include the president, the governor and lieutenant-governor of Connecticut, six elected graduates, and ten Congregational clergymen elected by the Fellows. The president was for 100 years the chief teacher. A professor of divinity was appointed in 1755, and a professor of mathematics in 1770. The present buildings occupy a square in the centre of the city (850 feet by 400). The endowment amounts to $700,000. There are four faculties or 'departments of instruction'—(1) of theology, organised 1822; (2) of law, 1824; (3) of medicine, 1812; and (4) of philosophy and the arts, which last includes (*a*) the academical department—the original school; (*b*) the Sheffield Scientific School, 1847; (*c*) the school of the fine arts, 1864; and (*d*) the school of graduate, non-professional instruction, a system of extra-mural teaching. 1. The Theological Faculty, in connection with the Congregational Church, was organised in 1822; the course extends over three years, and the education is gratuitous. 2. The Faculty of Law, begun privately in 1800, was organised in 1824; the course for the degree of LL.B. extends over three years (annual tuition fee $90): another year's study qualifies for Master of Laws, and a fifth for Doctor of Civil Law. 3. The Medical Faculty, organised in 1813, gives the degree of M.D. after a two years' course (annual tuition fee $105). 4. Faculty of Philosophy and the Arts (*a*) academical department; the course extends over four years (annual tuition fee $140); the degrees are B.A., Ph.B., M.A., Ph.D.; (*b*) Sheffield Scientific School; course three years for degree of Ph.B. in agriculture or mechanics. Bachelors of Arts may get Ph.D. after two years' study, and M.A. after one. In session 1876-77 Y. C. had 87 instructors; 95 theological, 60 law, 36 medical, 569 academic department, 206 scientific school, 16 fine arts, and 67 graduate students. Nearly 11,000 alumni have left its halls. There is a college library of 80,000 vols., a Linnæan Society library of 20,000 vols., and special libraries of 17,000 vols. The Peabody Museum was founded in 1866 (endowment $150,000). The President (1879) is Noah Porter (q. v.).

Yam, the name given to the fleshy tubers of several species of *Dioscorea* extensively used for food in many tropical and subtropical countries, where they are also largely cultivated. The genus consists of upwards of 150 species of herbaceous perennials or undershrubs with twining stems, leaves mostly entire with strongly-marked veins, flowers inconspicuous, arranged in spikes, fruit with membranous wings. There is much resemblance both in chemical composition and in the taste between the Y. and the potato. The following are some of the best-known species; the two first being grown to the greatest extent. (1) The Uvi-Y. of India and South Sea Islands (*D. alata*), also successfully cultivated in New Zealand and in the southern United States. The tubers, of which there are many varieties, will under favourable circumstances attain a length of 8 feet and a weight of 100 lbs.; they may be eaten baked or boiled. (2) *D. aculeata*, in which the stem is prickly, and unlike the above, does not require artificial support; it also ripens later than *D. alata*, has a sweet taste, and is spoken of as one of the finest esculent roots of the globe. It is found in India, Cochin-China, and South Sea Islands. (3) *D. hastifolia*, of W. Australia, found as far S. as 32°. The tubers are largely consumed by the aborigines for food, indeed it is the only plant on which they bestow any cultivation. (4) The hardy Chinese or Japan Y. (*D. Japonica* or *D. batatas*), which has been introduced into Algeria, S. France, and Australia, where it is reported to be of easy cultivation and to yield a prolific crop. (5) The Tivoli Y. (*D. nummularia*), a high-climbing prickly species; the roots are cylindrical, and their taste is 'exceedingly good.' (6) *D. pentaphylla*, a good Y.; the flowers of which are used as greens. (7) *D. purpurea*, Pondicherry potato, considered in Bengal the next best Y. to *D. alata*. (8) The root of it yields *D. sativa* of S. Asia, &c., which requires soaking before boiling; about 24 per cent. of starch. (9) *D. trifida*, cultivated in Central America. (10) *D. villosa*, called wild Y. or colic root, said to be a specific for bilious colic, and also used as an anti-spasmodic.

Ya'ma, the Hindu god of departed spirits, and the appointed judge and punisher of the dead. He thus exercised larger functions than the corresponding personage in Greek mythology, Pluto. His name occurs in the Vedas, and his image is still a common object of worship, represented with a grim countenance, riding on a buffalo.

Yambô', or **Yanbo'** (from its situation on the Red Sea coast also called *Y.-el-Bahr*), a town of the province of Hedjas, Arabia, and the harbour of Medina, which lies 131 miles to the E. It consists of a long row of white houses built of limestone and coralline, standing on the edge of an arid plain. It has considerable imports and transit trade between Suez, Jidda, and Medina. Marking the end of the third quarter of the caravan journey from Cairo to Mecca, Y. bears the title 'Gate of the Holy City.'

Yan'aon, or **Yan'am**, a French settlement in India, on the Telinga coast of the Bay of Bengal. It lies at the head of the

delta of the Godavery river, 9 miles above the sea, and is entirely surrounded by the British district of Godavery, in the Madras Presidency. The maritime trade is insignificant. The settlement is known to have been founded before 1750, and has more than once been occupied by the British. In 1839 it was devastated by a cyclone and storm-wave which destroyed all the official records. Area 2258 acres; pop. 5460; revenue £4550.

Yang-tsi-Kiang' ('son of the Great River'), the largest river of China, and probably of all Asia, takes this name only in its lowermost course, the entire stream being usually called by the natives only *Kiang* ('the river') or *Ta-Kiang* ('the great river'), while in almost every province it has a special designation. Under the name of Murussu (Chin. 'Mulusu') it rises in the Kuen-lun Mountains, forming the northern wall of Tibet, and forces its way S.E. and S. with numerous windings and cataracts through the wild mountainous plateaux of Tangut and Eastern Tibet till it reaches the Chinese province of Yunnan. Here it passes through a frightful gorge on the frontiers of Yunnan and Sze-chuen, then flows N.E. through the latter province and E. through Hu-pé, entering the great plain of China a little below King-chow, and touching in its winding course the great towns of Han-Yang, Han-kow, and Wu-chang. At Kew-Kiang, in the province of Kiang-Si, it finally turns N.E., and maintains this direction till it has passed Nanking, after which it proceeds E., washing the fortress of Ching-Kiang, and thence S.E., pouring its enormous volume of water into the Chinese Sea, N. of Shanghai. The total length of the Y., including all its windings, is over 3000 miles, and the most recent estimate of its drainage-basin gives it at 1,137,675 sq. miles. The Y. moves tranquilly through the great Chinese plain, safely girdled by its high banks. It is navigable for between 1400 and 1500 miles from its mouth. On account of its central course and the great number of rich provinces through which it winds, it is called the 'girdle of China;' and by its numerous affluents (of which the chief are the Ta-Chung, the Wen, the Kia-ling, and the Han-Kiang from the N.; and the Wu, Yuen, and Kan (through Lake Poyang) from the S.), and its connection with the Imperial Canal, it forms the most important water-way in China, and one of the greatest in the world.

Yani'na. See JANINA.

Yan'kee, at first a slang name for a New-Englander, was extended during the American Revolution to all the insurgents, and in the Civil War was the common designation of Federal soldiers by the Confederates. In England, Y. is applied to natives of the United States generally. Originally a corruption of *English*, or Fr. *Anglais*, by the N. American Indians, it was probably first used by the British soldiers in America in 1775. An American national air, *Yankee Doodle*, is said to have been popular in England in the time of Cromwell, who was ridiculed as 'Nankee Doodle.' Others say it was the original tune of the English song, 'Lydia Locket lost her pocket,' to which the words of *Yankee Doodle* were composed (1775) by a British sergeant.

Yap'ock (*Cheironectes Yapock*), a species of Opossum (q. v.), found chiefly in Brazil and Guiana, and adapted to a semi-aquatic life. The fore feet are webbed as far as the first joint of the fingers, and the hinder feet are wholly webbed. The ears are pointed, and there are cheek-pouches. The average length is about 2 feet, and the tail is long. The colour of the Y. is a fawn-tinted grey, marked with four transverse bands of black on the back. The food consists of fishes, insects, crustaceans, &c.

Yard, the British standard of length, is defined by Act of Parliament, 18 & 19 Vict. c. 72, July 30, 1855, as 'the straight line or distance between the centres of the transverse lines in the two gold plugs in the bronze bar deposited in the office of the Exchequer,' when the temperature is 'at 62° Fahrenheit.' Should this standard be destroyed, as happened at the burning of the Houses of Parliament in 1834, it may be replaced by means of its copies, or, should these fail, it can be restored by pendulum observations. The yard is divided into three feet, and each foot into twelve inches. The statute mile contains 1760 yards.

Yard, in the rigging of a ship, a horizontal spar hung across a mast by 'halyards' or 'lifts,' and sustaining and extending a square sail. It is adjusted to suit the wind by means of 'braces.'

Yarkund', or **Yarkand'**, the chief town of the province of the same name in E. Turkestan or Independent Tartary, 140 miles S.E. of Kashgar. It is a great emporium of trade between China and the W., but it has been repeatedly devastated by the internecine wars which are chronic in Central Asia. The pop. is estimated at 100,000. The bulk of the inhabitants are Mahommedans of the Turki race; and in 1866 it was captured from the Chinese by Yakub Beg, who afterwards entered into a commercial treaty with the British in India, and caravans of traders annually pass to and fro through the valley of Cashmere. A commercial treaty was signed between Yakub Beg and Sir Douglas Forsyth in 1874. The exports are chiefly shawl wool, raw silk, gold, and borax; the imports are piece-goods, metal wares, tea and indigo. In 1875–76 the registered exports from Y. into the Punjaub were valued at £19,000, chiefly *charas*, an intoxicating preparation of hemp; the imports at £9000, chiefly Indian tea. In 1876 an English company sent its goods direct to Y. under European conduct, and Y. merchants annually come down to the Punjaub. The soil of the province, which is watered by the Y. river, a tributary of the Tarim Kul, which flows E. into the lake called Lob Nor, is said to be fertile; the crops are wheat, rice, barley, millets, fruits, and mulberry; and there are large herds of sheep, goats, cattle, and horses. See Sir Douglas Forsyth's *Narrative* of his embassy.

Yar'mouth, capital of Y. county, Nova Scotia, 130 miles S.W. of Halifax, has a good town-hall, several churches, 3 secondary schools, and 2 weekly papers. Shipbuilding and fishing give employment to a pop. of (1871) 5335.

Yar'mouth, Great, a seaport of Norfolk, England, 20½ miles E. of Norwich by rail, stands on a neck of land between the estuary of Braydon Water and the German Ocean, about 2½ miles N. of the mouth of the Yare, a suspension-bridge over which connects it with the suburbs of Southtown and Gorleston. One of the distinguishing features of the ancient town is 145 'rows' or narrow streets, resembling the Edinburgh 'wynds,' which branch at right angles from the four main thoroughfares, and recall the sea-rover days when the townsfolk huddled within fortifications, of which only picturesque fragments of three flint-built towers survive, with trifling remains of the connecting curtains. But the sea-frontage wears all the aspect of a fashionable watering-place, two piers (450 and 753 feet in length) projecting from the fine esplanade, while the river is fringed by spacious and well-planted quays. St. Nicolas (founded 1101; partly restored by Mr. Hakewill (1848), and partly by Mr. Seddon (1864–1870), but still incomplete), is a noble cruciform structure representing every period of Gothic architecture, and the transitions. It is said to be the largest parish church in the kingdom, and has a tower and a spire 168 feet high; later churches are St. George's (1716), St. Peter's (1835), one for the beach-men (1858), another for wherry-men (1860), and a third for the fisher-folk. The public edifices include a town-hall (1716), Assembly and Reading Rooms (1862), the Trinity Corporation Buildings (1868), with an octagonal tower 75 feet high, covered fish-market (1867), Sailors' Home (1860), also a home for smack boys, erected as a memorial to the Rev. J. Walrond (1873), Grammar-School (1863), the Nelson Column (1817) 144 feet high, a theatre, public library, &c.; and new municipal buildings, with quarter and petty sessions courts: a central hall and assembly rooms are now (1879) about to be erected. The harbour was entered in 1878 by 1455 vessels of 181,760 tons, and cleared by 1499 of 186,478 tons; and on December 31, 7120 vessels of 31,126 tons were on its register, besides 1099 fishing-boats manned by 4633 hands. The herring-fishery is Y.'s staple, the 'Y. bloater' being widely famed. In 1877 there were landed here 254,760,000 herrings, a yield more than ten times as large as in any recent season. Other industries are shipbuilding (139 British vessels of 6592 tons during 1874–78), rope, sail, and net making, silk-spinning, and brewing; and there is a considerable trade, the exports (herrings, barley, malt, and ale) amounting in 1877 to £24,095, and the imports (timber, coals, corn, wine, and

brandy) to £403,753. Y. publishes three weekly newspapers, and returned two members till 1867, when it was disfranchised for corrupt practices. Pop. (1871) 41,819. See Nall, *Y. and Lowestoft* (1866); Palmer, *History of Y.* (1856), and *Perlustration of Y.* (3 vols. 1876).

Yarn is any textile fibre prepared for weaving into cloth. Yarns are spun into a great variety of sizes, according to the purposes for which they are intended, and the fact that different standard sizes are adopted in different countries leads to great confusion and seriously impedes international traffic. Many proposals have been made with the view of introducing a uniform standard, but no general agreement has hitherto been arrived at. In Great Britain the numbering of Y. is as follows: cotton and floss or spun silk, No. = number of hanks of 840 yards per lb. Flax and jute, No. = number of 'leas' of 300 yards per lb. Woollen and worsted Y., No. = number of skeins of 560 yards per lb. Raw silk, organzine, and tram are estimated according to French standard in 'deniers,' the No. = weight and grains per hank of 476 metres.

Yar'oslav. See Jaroslav.

Yarr'ow. See Achillæa.

Yarr'ow, an affluent of the Ettrick, rises at Yarrow Cleugh, 1½ miles E. of Loch Skene, flows mainly E. through the Loch of the Lowes and St. Mary's Loch, and joins the Ettrick 2 miles above the town of Selkirk, after a course of 25 miles. This river holds a unique place in Scottish song and legend. The district through which it flows embraces some of the finest scenery of its kind in Scotland; but it is not to this, but to the sad sweet ballad that tells of the despair of love on the 'dowie dens o' Y.,' that it owes its rare romantic interest, and the spell that drew some of their finest poems from Hamilton of Bangour, Logan, and Wordsworth.

Yawl. See Jollyboat.

Yawn'ing, a modification of the act of inspiration, in which the action is intensified and prolonged, while the muscles of the jaws, and, to some extent, those of the larynx as well, are spasmodically affected so as to produce an enlargement of the mouth. Y. is involuntary, and may be excited through the imitative principle by the occurrence of the act in another person.

Yaws, or **Frambœ'sia,** generally considered an acute specific disease, occurs in Guinea, America, Africa, and the West Indies, particularly in Jamaica and Dominica. Y., called also *mycosis* (fungus) and *piaro*, is almost entirely confined to the African races, and was brought to the W. Indies by negro slaves. A report on this disease has been recently published by the Colonial Office from the pen of Dr. Gavin Milroy; and Doctors Fox and Farquhar have recently published, under the sanction of the Secretary of State for India, an account of it in their work *On Certain Endemic Skin Diseases of India*, the first satisfactory description of Y. which has been published. It has been very fully investigated by Dr. Imray of Dominica, and Dr. Bowerbank of Jamaica. Dr. Imray says:—'If Y. are observed as they first make their appearance on the surface, one or more minute whitish or yellowish points or spots will be perceived, not larger than a pin's head. These yellow spots are seen very distinctly on the dark skin of the negro. Gradually the spots enlarge, and begin to project from the surface, retaining for the most part their circular form, and have much the appearance of small globules of yellow pus, and unless carefully examined might be so mistaken. The skin remains unbroken until the Y. attain perhaps the size of a small pea, but the cuticle may give way at any time. Then a yellowish, spongy surface presents itself, from which a thin fœtid fluid oozes, and this spongy body continues to enlarge, and projects considerably from the surface. Y. are usually circular in form, and may be seen in the same patient of all sizes, from scarcely more than a pin's head to a patch of more than one or two inches in diameter, and in every stage of their progress. Generally they are separate, but sometimes in groups close together, small and great. Again, they are met with of an oval form, but more rarely. In other cases they are irregular in shape, and so close together as to make one mass. It frequently happens that one of these tubercles assumes very large proportions, one or two inches in diameter, or even more, projecting from the skin like the other Y., and covered with yellow scabs, receiving in English the name of *mother* Y., and in the French patois, *maman pian.* All the other Y. may entirely disappear, and the mother Y. only remain; and, if neglected, it will degenerate into an intractable ulcer, eating its way into the tissues, and causing extreme and irreparable destruction of the parts around, and be often accompanied by great constitutional irritation and extensive emaciation.

'The eruption generally breaks out on the face, the neck, the upper and lower extremities, the parts of generation, the perinæum, the hips, and about the anus. They are much less frequently observed about the trunk, and are not so often seen on the hairy scalp. They may form on the nostrils where the mucous membrane joins the skin, and here the Y. may assume an elongated form, nearly closing the nostril, and hanging down on to the lip. Near to the mouth they may appear in such numbers and so closely set as to form almost a ring around the mouth. This is especially the case in children. Around the anus also they sometimes coalesce, and form one projecting circular band, an inch and more in breadth. An attack of Y. varies much in severity as regards the size and actual number of Y.'

The usual duration of Y. is from two to four months, under appropriate treatment; or about thirteen months in severe cases; but it may last for years with periods of quiescence. Y. is a communicable disease, and Dr. Imray speaks positively of its being conveyed from person to person by contact, or the absorption of the poison through some abraded surface, though it is not infectious. The poison may be carried from individuals by flies. The period of incubation is thought to be from three to ten weeks.

Regarding the treatment of Y., Dr. Imray says:—'In the early stage it is customary first to wash the patient, then to encourage the full development of the eruption by the exhibition of sulphur and supertartrate of potash for six or eight days. In the next place, mercury is to be administered in conjunction with decoction of sarsa, or sassafras, or mezereum, in the form of *tisanes*, to which great virtues are attributed. The mercury is to be dropped directly signs of its action on the gums show themselves. Tonics should be conjoined with mercurials in the case of weak persons. Occasionally aperients are also needed. The diet should be good and unstimulating. As regards local applications, Dr. Imray advises a carbolic-acid solution, or weak nitrate of mercury ointment. The natives apply the boiled and beaten-up leaves of the physic nut, *Jatropha curcos;* the juice of the sour orange, the *Janipha manihot;* or the flowers of sulphur dusted over the part. Mercury, according to Dr. Bowerbank, is the active ingredient in all the Y. specifics used in Jamaica. Iodide of potassium is also efficacious, especially if the disease attacks the mucous membranes. See *Report on Leprosy and Y. in the West Indies*, 1873, printed at H.M. Stationery Office, and issued in 1873; *On Certain Endemic Skin and other Diseases of India and Hot Climates generally*, by Tilbury Fox, M.D., and H. V. Carter, M.D. (Lond. 1876).

Yazoo' River (from an Indian word meaning 'river of death'), a tributary of the Mississippi, United States. It lies throughout its whole extent in the state of Mississippi. The Y. R. proper, formed by the confluence of the Tallahatchie and the Yallobusha, commences below Polckville, and after a deep, slow, tortuous S.W. course of 290 miles enters the Mississippi 12 miles above Vicksburg. It traverses a fertile country, and is throughout navigable. The waters of the Tallahatchie are partly received from the Mississippi itself, and, but for a slight obstruction, steamers from the Mississippi might thus enter the Y. R. at its extreme source, and after traversing its whole length, re-enter the Mississippi at Vicksburg.

Yea'don, a town of the W. Riding of Yorkshire, England, in the Valley of the Aire, 6 miles N.N.E. of Bradford. It has large woollen mills. Pop. (1871) 5246.

Year, a period of time determined by the earth's revolution round the sun, including the four seasons, and usually divided into twelve months. Its value, expressed in mean solar days (see Day), varies somewhat according to the manner in which it is reckoned. Thus the *sidereal* Y., or the interval between the instant at which the earth, sun, and a given star are in a certain relative configuration, and the next instant at which they are in

the same configuration, is 365.25638 mean solar days. The moist yellow surface, streaked with red. This, amongst the *equinoctial* or *tropical* Y., *i.e.*, the interval between the earth's successive returns to a given point on the ecliptic, such as one of the equinoctial points, is only 365.24226 days, somewhat less than the sidereal year because of the annual precession of the equinoxes (see PRECESSION). The *anomalistic* Y. is the time in which a revolution is completed with respect to the apses, and is 365.25971 days, a little longer than the sidereal Y., because of the progressive motion of the apse. Of these the most important from terrestrial considerations is the tropical Y., since it is upon the passage of the sun from the one side to the other of the ecliptic that the phenomenon of the seasons depends. It is therefore also the *civil* Y.; but for convenience it is advisable that the ordinary Y. of reckoning should contain an exact number of days, either 365 or 366. The former would of course be too small and the latter too large; and the error, if suffered to accumulate, would soon make the first day of the Y. occur at all possible seasons. For example, if the length of the civil Y. be taken at 365 days, there would be nearly a day of error in four years, and a whole Y. within 4 centuries. To obviate this, Julius Cæsar, advised by the astronomer Sosigenes, ordered that the civil Y. should every four years have 366 days. This made the Y. exactly equal to 365¼ days, a little over 11 minutes too long, an error which at the time of Pope Gregory XIII. (1582 A.D.) had amounted to ten or eleven days. To correct this, a modification was then introduced, which made the even centuries ordinary years, excepting such as are divisible by 400, which are leap years. According to the Gregorian calendar, then, a Y. is 365·2425 mean solar days, which is greater than the true Y. by nearly 21″, an error which requires nearly 4000 years to amount to a day. See CALENDAR, MONTH, DAY, &c.

Yeast is an organised substance consisting of minute globular or ovoid cells, which under favourable circumstances develop and increase with great rapidity, by new cells budding from the parent cell. The cellular organism belongs to the simple form of life which occupies a middle place between the vegetable and animal kingdoms, although it is generally classed among vegetable bodies, and regarded as a fungoid spawn, to which the name *Saccharomyces cerevisiæ* is given. Y. is the active agent in producing alcoholic fermentation in all saccharine solutions, its growth in any solution containing or capable of producing sugar, causing the sugar acted on to decompose into alcohol and carbonic acid, with some other substances of minor importance. It therefore plays a most important part in industrial economy, as it not only is essential to the production of wine from grape juice and other fruit juices, the manufacture of beer, and in the preparation of distilled spirits, but it is also the agent in producing the panary fermentation whereby ordinary bread is rendered light, porous, and spongy. The Y. organism has been the subject of numerous and most valuable investigations, the latest and greatest of which are those of M. Pasteur, who has demonstrated that alcoholic fermentation is the invariable result of the action of Y. cells on, and their growth in, solutions of sugar, and that when fermentation other than alcoholic ensues, it is due to the action of agents other than ordinary Y. cells, which indeed possess an individual existence as distinct as that of any species of being. This observation is of the utmost practical importance as explaining the various obscure and most troublesome maladies which affect all fermenting liquids, and often lead to serious loss on the part of wine-producers, brewers, and even bakers. M. Pasteur has further indicated a means whereby practically pure Y. cells may be obtained, and thus safe and uniform vinous fermentation secured. The Y. obtained from the surface of fermenting beer-mash is known as barm, and used for starting new fermentation, and for the preparation of bread. Dry or German Y., which forms a considerable article of import and trade, is made by removing the barm from the surface of a fermenting liquid, straining off any liquid portion through a fine sieve, and then pouring the barm into cold water, in which it sinks to form a sediment. The sediment is subsequently collected, placed in a stout bag, and pressed into a doughy mass, with the addition of a proportion of potato starch. For further details see BREAD and BREWING.

Yedd'o (officially *Tokio* or *Tokai*), the capital and the largest city of Japan, situated in a fertile plain watered by a canal from the Tonegawa River, on the E. side of the island of Nipon, and at the head of the Bay of Y., 18 miles N.E. of Yokohama by rail. The town is well built, its straight streets crossing regularly at right angles, and it is next to London the most spacious city in the world, covering a total area of 60 sq. miles, only 28 sq. miles of which, however, are built over, the remainder being covered with intervening gardens and groves, while one-eighth of the whole is occupied by moats and canals. Y. comprises three towns: (1) *Siro*, the central part of the city, or the citadel, and the military quarter, containing the residence of the Mikado, surrounded by a stone wall and a moat; (2) the *Soto-Siro*, joined to the former by more than 30 granite bridges, containing upwards of 3000 palaces, the residences of those nobles of high rank (Daimios and Hattamothos) whose possessions were not sequestrated at the suppression of the feudal system, also the locality of the government buildings, colleges, schools, arsenals, barracks, foundries, steam-mills, and factories; (3) the *Midsi* or merchant city, densely populated, and closely built with brick and stone buildings in the European style. At the N. and S. ends of the city are the cemeteries, filled with tombs and temples. In the city are 741 Shinto shrines, 2179 Buddhist temples, and 4 Christian churches. The Government estimates for 1875-76 include an item of £64,000 advanced for brick houses in Y. The city has been repeatedly destroyed by earthquakes, most recently in November 1855, and, accordingly, the houses consist at most of two stories, the upper chambers being used only as store-rooms. Many of the houses are built of bamboo-wood and cement, but, being painted white, they have the appearance of being of stone. The interiors consist of but one chamber, divided into apartments by paper-screens. Everywhere the most scrupulous cleanliness prevails. Fires are very frequent, notwithstanding the extraordinary precautions taken against them. At certain distances at the principal points of the city rise high bell-towers in the form of columns, which are mounted by a series of ladders and provided with great bronze bells, and which command the whole quarter. In almost every house a wooden fire-engine is kept in readiness, and every fifty steps are arranged pyramids of buckets kept constantly filled with water. The old palace of the Mikado was burned down, May 5, 1873, but has been lately rebuilt at a cost of £200,000. Water is abundantly supplied by wooden aqueducts from the Tonegawa, 9 miles distant. For police purposes Y. is divided into six principal and ninety-six smaller districts, with stations connected by telegraph, and a force in uniform of 3500 men. Y. has an imperial university with 100 foreign instructors, and its schools have an aggregate attendance of 60,000 pupils. It has several banks, and 18 newspapers and periodicals; and native capital has established many cotton, woollen, and paper mills driven by steam. Hundreds of horse vehicles and over 20,000 *jin-siki-sha* ('man-power carriages') ply the streets, which in 1872 were first lighted with gas. On the 12th June of the same year the first railway to Yokohama was opened. Its receipts in 1875 were £86,559. Other lines have been projected to connect the capital with Osaka, Hiogo, and Kioto, the last 236 miles distant from Y. It is connected by telegraph with Nagasaki, Hakodadi, and other cities. Y. has no direct foreign trade of any consequence, as its harbour only receives small vessels. All its imports pass through the custom-house of Yokohama (q. v.). In 1877 there were at Y. 468 Europeans and 54 Chinese. Pop. (with the suburbs, 1874) 813,500. Y. was laid out in 1591, when the walls of the present citadel were built. In 1650, in 1854, and again in 1855, it suffered severely from earthquakes. In 1861, British and French legations were established here, but were soon forced to leave, not to return until 1865. In 1862 Y. ceased to be the compulsory residence of the Daimios, and in 1868 it became the residence of the Mikado, when its name was changed to Tokio ('eastern capital'). On January 1, 1869, the port was formally opened to foreign trade, and in the summer of 1871 Y. became the centre of the entire power of the empire. See Sir Rutherford Alcock, *Capital of the Tycoon* (Lond. 1863); Fortune, *Y. and Pekin* (Lond. 1863); and *Pekin, Y., and San Francisco: The Conclusions of a Voyage Round the World*, from the French of the Marquis de Beauvoir, by A. and H. Stephenson (Lond. 1872).

Yell, the second in size of the Shetland Isles (q. v.), and, except Unst, the most northerly of the group, is separated from the Mainland by Yell Sound, and from Unst by Blue Mull Sound. From N. to S. it measures 17 miles, while its extreme breadth

is 7½ miles. Area, 94 sq. miles; pop. (1871) 2732. The E. coast is low and flat, the W. rocky and precipitous, and the surface is hilly, much of it barren moor. Fishing is the chief occupation of the inhabitants.

Yell'ow Berr'ies. See FRENCH BERRIES.

Yell'ow Bird (*Chrysomitris tristis*), a species of Finch inhabiting N. America. It is yellow above, with a black head, wings, and tail. The under parts are of a brown colour. The average length of the Y. B. is 5 inches. It is often domesticated on account of the sweetness of its song. The food consists chiefly of the seeds of plants.

Yell'ow Col'ours. The most important yellow pigment is chrome yellow, a chromate of lead which can be prepared any shade of yellow and orange. Other Y. C. are Naples yellow, a compound oxide of lead and antimony, cadmium yellow, a sulphide of cadmium, Dutch pink, a yellow earthy colour prepared by impregnating an earth with extract of Persian berries, Indian Yellow (q. v.), yellow ochre, an earth coloured with oxide of iron, and orpiment or arsenic yellow, which consists of a sulphide of arsenic.

Yell'ow Fe'ver is 'an infectious continued fever, ushered in with languor, chilliness, and more or less severe lumbar pain and frontal headache, countenance flushed, eyes at first humid, then suffused, and ultimately ferretty, skin imparting a tingling heat to the touch, and, as the second stage advances, gradually acquiring a lemon or greenish-yellow tinge, mind usually disturbed with hallucinations, or more or less violent delirium, restless watchfulness, or, possibly, drowsiness even to extreme coma, epigastric uneasiness, spontaneous vomiting without effort, first of a clear glairy fluid, but subsequently with *coffee-ground* flocculi, or blood itself, often, towards the close, with irrepressible hiccough, and wild shrieking or melancholy wailing, tendency fatal, but the disease generally confers an immunity from subsequent attacks.' The first recorded outbreak of Y. F. occurred in the West Indies in 1647, and since that time it has been recurring at regular intervals in an epidemic form, and gradually extending its range; but it is endemic in certain localities, and notably so in the islands of St. Thomas and St. Domingo. Regarding its *altitudinal* and *horizontal ranges* Dr. Macdonald says,—'It may be very well to assign an altitudinal limit of the spread of Y. F.; and, roughly speaking, this may be estimated at between 2000 and 3000 feet above the level of the sea, but the local conditions of every country seem to determine a range peculiar to itself. Thus the disease has been known at Newcastle, Jamaica, at an elevation of 4000 feet, while in the valley of the Mississippi its highest recorded range is about 600 feet (admitting the fever of Gallipolis to be of the genuine type). Humboldt alludes to the farm of Encero, in Mexico, at an elevation of 3243 feet, as the altitudinal limit of black-vomit. At St. Domingo the encampments of the French in 1792 and of the English in 1796 enjoyed an immunity from the disease, while it was spread far and wide among the troops in the low country. Though the West Indian islands, and the neighbouring coasts of North and South America, may be looked upon as the focal area of Y. F., yet, taking the outlying points at which its occurrence in the epidemic form has been recorded, its geographical range must be regarded as very considerable indeed, *i.e.*, between 97° W. and 2° E. longitude, and between 48° N. and 35° S. latitude. At least for the space of a century and a half, up to the year 1850, the river Amazon, dividing the Brazils from Guiana, limited the extension of Y. F. south of the line; and while the disease was raging at Rio and Bahia, at the close of that epoch, the Montevideans flattered themselves that they were without the geographical limits of the pestilence, until it fell to their turn to sustain its visitation several years later, when the illusion was dispelled. Similar facts may be adduced regarding the extension of the disease along the shores of the Pacific; so that, however well we may be acquainted with its present range, making all due allowance for temperature, we cannot tell what the future may bring forth. In this connection it may be mentioned that a temperature of at least 72° is assumed to be essential to the development of Y. F., though cases exceptional to this rule may now and then happen.'

The phenomena of Y. F. evidently result from the operation of some specific organic poison upon the system through the blood, the poison being eliminated chiefly by the gastro-intestinal mucous membrane when both liver and kidney have been rendered ineffective in bringing about this result. There can be no doubt whatever that Y. F. is a communicable disease, though there is difference of opinion as to whether it is contagious or infectious; or as to whether the specific poison is generated within or without the human body. Hænisch says:—'Y. F. is most probably produced by a living miasm, which has hitherto entirely eluded microscopic demonstration, but the existence of which is argued from very many facts. These seeds of disease, as soon as they become in any way established in a human organism, set up in it that diseased process to which we are accustomed to give the name of Y. F. They are not, however, reproduced in this diseased organism, they do not multiply in it, nor migrate from it to other men; Y. F. is not, then, in this sense, a contagious disease. But its seeds long retain their poisonous nature; they are, under certain circumstances, quite indestructible, and when placed in suitable external conditions are capable of kindling an epidemic even far away from their place of origin.' This seems to be a commonly received opinion by physicians engaged in practice in districts where Y. F. is frequently epidemic. The Surgeon-General of the United States Marine Hospital Service stated, in a circular issued in September 1878, that 'Y. F. patients have been treated in the marine hospitals at St. Louis, Cairo, Louisville, and Cincinnati without communicating the disease, simple precautions having been taken to disinfect the clothing and other effects immediately on receiving the patients. It is a well-known fact that the unacclimatised attendants upon Y. F. patients at the New York Quarantine Station do not contract the disease. Y. F. is transported by *things*, and not by persons considered apart from clothing.' The late Dr. Nott of Mobile, the late Dr. Warren Stone of New Orleans, and Professor Stillé of Pennsylvania, maintain the same doctrine; but the question still remains *sub judice*. The infectious nature of Y. F. is generally admitted by British physicians. Professor Stillé sums up a recent lecture (March 1879) on Y. F. as follows:—'(1.) Y. F. originates nowhere but in the West Indies. (2.) Its morbid poison is conveyed elsewhere in ships and fomites. (3.) Wherever conveyed, a high temperature is essential to its propagation. (4.) A strict quarantine is always efficient in preventing its dissemination. (5.) It is not contagious. (6.) Its essential cause cannot be isolated or defined, but must be assumed to be a specific poison. (7.) This poison in the system acts primarily in two ways, by disintegrating the blood and inflaming the stomach; and that, secondarily, it tends to impair the eliminating functions of the kidneys.' Professor Stillé, however, admits that Y. F. is highly infectious.

The last great epidemic of Y. F. occurred in the United States of America in 1878. The disease was introduced into New Orleans on May 23, 1878, and before July 12th, thirty or forty deaths from it had occurred, the reports of which were at the time suppressed. It broke out in the form of a series of groups of cases, each being connected with some other by personal association or by exposure in the same locality, and from these separate foci the conflagration spread over the whole city. Thence it was carried in the clothing or about the persons of people going from the infected districts. In other instances it was conveyed in such fomites as cotton bagging, or goods of some description, or bedding and blankets. The panic-stricken inhabitants of New Orleans sought refuge in flight, and spread the infection eastward and northward to the Ohio River and beyond it. The epidemic continued till October 1878, and the estimated number of deaths was about 15,000.

In December 1878 a Board of Experts, consisting of twelve medical men and a sanitary engineer, with Surgeon-General Woodworth as President, was appointed by the Health Committees of the Senate and House of Representatives of the Congress of the United States of America to investigate the Y. F. epidemic, and they came to the following conclusions. (1.) Y. F. is a specific disease, due to a specific poison which has not been chemically or microscopically demonstrated, nor in any way made evident to the human senses; it is material and particulate, and endowed with the vital properties of growth and reproduction; the disease is not malarial, and malarial influences do not contribute towards its dissemination or mortality to any greater extent than to other epidemic diseases; a concurrence of local conditions seems to be necessary to the evolution of the disease, but what these are we have no positive knowledge. (2.) Y. F. is a disease of singular local attachments,

often prevailing in a very small section of a city, with remarkable indifference to topographical and social surroundings; whilst atmospheric air is the usual medium by which it is conveyed, it has been in no instance established that the disease has been carried to any considerable distance by atmospheric currents, or by any modes or vehicles of conveyance other than those connected with human traffic and travel; the period of incubation varies from two to five days; the fever is unknown in Asia; the white race is most susceptible to its influence, and furnishes the highest ratio of deaths. (3.) Y. F. is a disease of warm climates and of warm seasons; it is destroyed easily by exposure to air, by frost and by chemical disinfectants, when they can be adequately used; and one attack confers immunity from a second. (4.) The disease was unknown to the inhabitants of the eastern hemisphere until after the discovery of America by Columbus, and the islands of the W. Indies are its home; it has never made its appearance on the great continent of Asia, nor in Australia, nor in any of the islands of the Pacific Ocean, nor on the Pacific coast of the American continent; and outside the W. Indies the disease is an exotic. (5.) The fever has invaded the United States in eighty-eight different years, in seventy-seven of which there is evidence of importation, and in seventy-one of these seventy-seven the evidence points to the W. Indies; that, as a rule, very nearly without exception, Y. F. has always appeared in some of our seaports before it has made its appearance anywhere in the interior of the country; the disease is not indigenous to the United States, and it travels by the lines of human intercourse, no instance of communication having occurred in shorter time than would have sufficed for a man to have made the same journey.

Regarding the *treatment* of Y. F., it may be said that there is no known specific, and it is thus symptomatic; but whatever is to be done should be done quickly, and the earlier a clear diagnosis is formed the better. The fever commences abruptly, and is attended with severe headache, great irritability of the stomach, and vomiting, the vomited matter being first slimy and tasteless, but afterwards black like coffee-grounds. When the sixth day elapses without the occurrence of black vomit or suppression of urine, hopes of recovery may be entertained, but the mortality is usually one in three. On the first invasion of the disease the *pediluvium* may be employed, and warm drinks given to promote perspiration. The bowels, which are usually constipated, should be opened with a purgative; and, if the constipation continues, by enemata. Acetate of ammonia, nitrate of potash, nitrous ether, and the tincture of squills and hyoscyamus may be given, and lime-juice for drink. The irritability of the stomach may be allayed by limewater in combination with milk; or chalk-mixture, as the vomiting frequently depends on the presence of free hydrochloric acid in the stomach. Creosote, hydrocyanic acid, chloroform, or chlorodyne may be used, and when procurable, ice may be swallowed. Morphia may be injected subcutaneously in the epigastric region. Chlorate of potash and tannic acid have been recommended. The strength should be supported by giving, after short intervals, the essence of beef, and digestion will be aided by the administration of pepsine. Stimulants should also be given, champagne in particular when it can be procured. Hænisch suggests that transfusion of blood, after previous blood-letting, might paralyse or modify the injurious operation of the Y. F. miasm. Surgeon-General Woodworth recommends those exposed to the infection of Y. F. to use small doses of quinine, chlorate of potash, and tincture of iron. 'As the poison enters the system through the air-passages, it has been suggested that the nasal passages be bathed frequently with a solution containing quinine, to be applied by means of a nasal spray.' See *Y. F.*, by Dr. Macdonald, in Reynolds' *System of Medicine* (Lond. 1878), *Y. F.*, by Hænisch, in Ziemssen's *Cyclopædia of the Practice of Medicine* (Lond. and New York 1874), *Practical Hygiene*, by Dr. Parkes (Lond. 1878), *Conclusions of the Board of Experts Authorised by Congress to Investigate the Y. F. Epidemic of* 1878 (Wash. 1879), *Y. F., its Origin, Propagation, &c.*, by Professor Stillé, in *Medical Record* (New York, March 1879).

Yell'ow Legs (*Gambetta flavipes*), a *Grallatorial* or Wading bird, allied to the *Scolopacidæ* or Snipes, and found along the eastern coasts of N. America, passing to the north in summer, but returning south in winter. Its average length is 10 inches, and the colour is ashy brown above and white beneath, both surfaces being marked with brown. The legs, as the name indicates, are yellow, the bill is straight, slender, and pointed. The Y. is esteemed as a table bird, especially in autumn, when it is in good condition after its summer feeding.

Yell'ow Hammer or **Yell'ow Bunting** (*Emberiza citrinella*), a species of Bunting (q. v.), common in fields and hedgerows, and attaining a length of 6 or 7 inches. It is of a bright yellow hue, with dark-brown markings, that of the back being mottled with brown. The under parts are a pure, brilliant yellow, and the flanks are brown. The colours of the female are less vivid than those of the male. The song is somewhat plaintive. The nest of the bird is usually found at the roots of hedges buried among the long grass growing in such situations. The female lays five eggs of white colour, marked with brown, and both parents tend the young. In winter the Y. H. becomes very fat, and is then in esteem for the sake of its flesh. The proper name of the bird is 'yellow-ammer,' 'goldammer' being the German form.

Yell'ow Sea', or **Whang-Hai'**, a great gulf of the Pacific Ocean on the N.E. coast of China, bounded on the N. and E. by Corea and Japan, and on the W. by China proper. From N.W. to S.E. its length is 600 miles, while its breadth is often 350. The Gulf of Pe-chi-li forms its upper and inner extremity. Extremely shallow, the Y. S. is gradually silting up. It receives its name from the yellowish mud which forms much of its bottom.

Yell'owstone Riv'er, in the N.W. corner of Wyoming Territory, United States, flows N. from the upper corner of Yellowstone Lake (330 sq. miles in area, 7427 feet above the sea), and after a course of 1300 miles reaches the Missouri, having descended about 7000 feet. In 1872 Congress set apart a tract of land 55 miles by 65 about the sources of the Yellowstone and Missouri rivers as a great national park for the benefit and enjoyment of the people. See UNITED STATES.

Yell'ow Throat (*Trichas Marylandica*), a species of Warblers (q. v.) occurring in N. America. Its length is about 5 inches, and the colour olive-green above, with a yellow breast and throat, the male exhibiting a black band on the forehead as part of its summer plumage. The nest is built on the ground, and the song is musical, but not very strong.

Ye'men (*i.e.*, 'the land to the right of Mecca'), a district in the S.W. of Arabia, bounded on the N. by Hedjas and on the E. by Hadramaut, and measuring about 400 miles in length by about 150 in breadth. At about 30 miles from the coast a range of wooded mountains (rising occasionally to 6000 and 8000 feet) stretches along the whole length of the country. Between this range and the sea stretches the scorchingly hot plain called Tehameh. Further inland the country becomes an elevated plateau. Though destitute of rivers, the whole region is very fertile, and coffee, tobacco, dates, gums, and spices are produced and exported in abundance. There are valuable pearl-fisheries on the coast. The inhabitants are Arabs, but possess many distinctive characteristics, and are supposed to be descended from the ancient Sabæans. The government rests with the different sheiks or tribal chiefs, among whom the Imaun of Sana (q. v.) holds supreme authority. The principal towns in Y. are Sana (q. v.) the capital, Mocha (q. v.), and Hodeda Mareb. Aden (q. v.) is not now within the limits of Y. The *Arabia Felix* of the ancients, Y. was conquered by the Abyssinians (525 A.D.) and Persians (597). In the year 628 it submitted to Mohammed, since the 16th c. has been subject to Turkey, and after the extension of Turkish rule (1871–73) was formed into a vilayet.

Yenika'lé or **Kertch** (formerly of *Kaffa* or *Feodosia*), **Strait of**, the Cimmerian Bosphorus of antiquity, connects the Sea of Azov with the Black Sea. It is 20 miles long, 2 miles wide at its narrowest part, and is much interrupted by shoals.

Yenisse'i, the longest river of Siberia, rises as the Kem to the W. of the Kosso-Kol, S. of the Gurbi Mountains, flows W. as the Ulan ('Great') Kem between the Sayan and Tangnu Mountains, then suddenly breaks northward through the Sayan Mountains, and after a course of 3440 miles falls into the Arctic Ocean. Its breadth varies from 3400 feet to 14 miles, and during the last 140 miles it is so wide as to form an arm of the sea. Its depth varies from 11 to 90 feet. The waters of the Y.

are clear and rich in fish. They are navigated (1878) by four paddle-steamers, of 20 to 60 horse-power, and drawing barges of 64 to 240 tons, and by 13 boats of 40 to 45 tons, besides a number of five- or six-cornered flat-bottomed boxes which convey flour down stream, and are broken up at their destinations. The Y. receives from the right the Upper Tunguska or Angara (the outlet of Lake Baikal), the Irkut, Middle Tunguska, and Lower Tunguska. Nordenskjöld's (q. v.) voyage in the summer of 1875 from Tromsö to the mouth of the Y. opened up a trade by sea with N. Siberia, in which a number of vessels are now (1879) engaged, finding six weeks in summer when the passage to and from the Y. can be made with little difficulty.

Yenisseisk′, a government of E. Siberia, Russia, bounded E. by Yakutsk and Irkutsk, S. by Mongolia, W. by Tomsk and Tobolsk, and N. by the Arctic Ocean. Area, 992,571 sq. miles; pop. (1873) 396,783. The S. part is occupied with the Altai Hills and their offsets. In the Yenissei valley considerable tracts are under tillage, but N. of the town of Y. this is succeeded first by pasturage, then by stretches ever more and more desolate, to the frozen *tundras*. The chief river is the Yenissei (q. v.). Smaller streams are the Taimyr, Katanga, and Anabar, which, like the Yenissei, form great gulfs at their mouths. The gold-washings of Y. occupy 12,000 to 15,000 men and several thousand horses. Of the native tribes, who live by hunting, fishing, and trade in fur, the most are Samoyedes and Tungus. The capital is Krasnoiarsk (q. v.).—**Y.**, a town in the above government, on the river Yenissei, under 58° 27′ N. lat., has 11 churches with gilded cupolas. The trade in flour, sugar, tea, tobacco, and especially schnaps, is mainly dependent upon the gold-washing. There are 157 public-houses and 4 small schnaps-distilleries. Pop. (1878) 6000.

Yeolá, a town in Nassick District, Bombay Presidency, British India, 130 miles N.E. of Bombay. Pop. (1872) 17,461. It has special manufactures of silk and cotton cloth, woven on the hand-loom with elaborate designs, with broad borders of gold or silver thread.

Yeo′man, the '*man* of a *Gau*' (q. v.) or country district (*cf.* Fris. *gæman*, 'villager'), from a designation of a menial servant, became the title of one who had 'free land of forty shillings by the year' (Blackstone), and so ranked next below an esquire.

Yeo′manry, a force of volunteer cavalry in Great Britain consisting of county gentlemen and yeomen. It dates from the great struggle with revolutionary France. The Y. are organised in local troops of from 40 to 100 men, to each of which a drill-sergeant from the regular army is attached. From 4 to 8 troops form a regiment which is entitled to an adjutant; 42 corps of 233 troops, in all numbering about 15,000 men, are now (1879) in existence. Unlike the ordinary volunteer force, the Y. may be called out in aid of the civil power in addition to their being liable for service on invasion of the country by a foreign enemy. They undergo six days' training in each year, when they receive a subsistence allowance of 7s. per day, and 2s. per day for forage, and they must also attend nine drills yearly, when an allowance of 2s. per man and 1s. 4d. per horse is made for each occasion. They must furnish their own horses, but are allowed £2 each per annum for clothing. The constitution of the force is regulated by the Volunteers Act of 1804 and the Y. Regulations of 1864.

Yeo′men of the Guard, or, as they are vulgarly called, **Beefeaters** (q. v.), a company of veteran soldiers, 100 strong, forming on state occasions the body-guard of the sovereign, conjointly with the gentlemen-at-arms. They are officered by a captain (usually a peer), a lieutenant, an ensign, and four exons. The corps was constituted by Henry VII. in 1485, and the old-fashioned uniform worn by them is of the period of his reign.

Yeo′vil, a town of Somerset, England, on the Yeo, 20 miles S.E. of Bridgewater by rail. Among its buildings are the church of St. John, a Perpendicular edifice of the 15th c., the new Trinity church, and 5 Dissenting chapels, also an almshouse and town-hall. The manufacture of gloves is the staple industry. Upwards of 2000 men are employed in the factories, and still more women are engaged sewing in their homes. There are also woollen manufactures, and much butter is produced in the neighbourhood. Pop. (1871) 8527.

Yess′o, or **Jess′o**, an irregular island of Japan, N. of Nipon, 350 miles long by 250 broad. Area, 35,739 sq. miles; pop. (1872) 123,668, mostly Ainos ('hairy men'), who are thought to be the last remnants of the aborigines of Japan, an active, docile race, living by hunting and fishing. A *terra incognita* up to 1862, Y. was thoroughly surveyed during 1871–75. It has a wild, mountainous, volcanic surface, is well wooded, and abounds in bears, deer, and wolves. Coal and sulphur are plentiful, and the fisheries of the rivers and neighbouring waters promise much future wealth. The Japanese are gradually opening up the southern portion, and 190 miles of road have been constructed. Sapporo, the capital, and Hakodate (q. v.), a treaty port, are both in the S.

Yeth′olm, a village of Roxburghshire, Scotland, 7 miles S.E. of Kelso, consists of two parts, Town and Kirk Y., which are linked by a bridge over the little Bowmont. Lying at the foot of the Cheviots and within 1½ miles of the English Border, Kirk Y. has for at least two centuries been famous as the 'Gypsy town.' Its quaint old inn, resembling a Spanish *venta*, was kept by Will Faa, smuggler and Gypsy king (1784–1847); a little above it stands the lowly palace of Queen Esther Faa Blythe, who was crowned 'with many a barbaric ceremony' in 1861. But, in truth, these Gypsies, who numbered (1862) 126, have become so mixed with Irish and the surrounding natives, as to have lost almost every trace of their ancient tongue and their ancient customs. See Borrow's *Romano Lavo-Lil* (Lond. 1874).

Yew (*Taxus*), the type genus of the tribe *Taxineæ* of the natural order *Coniferæ*, and comprising, according to Parlatore, six species (all, however, reduced to forms of *T. baccata* by Hooker). They are slow-growing and long-lived evergreen trees or shrubs, with tough red heartwood, leaves linear, distichous, flowers sessile in the axils of the leaves, generally diœcious, male catkins subglobose, the female flowers consisting of a few imbricate scales enclosing an erect ovule surrounded at the base by a disc which enlarges into a red fleshy cup surrounding the seed. *T. baccata* extends throughout Europe, N. Africa, and in Asia eastward to the Himalaya. It forms a large tree with dense dark-green foliage, is of very slow growth, attaining not uncommonly in England a girth of 25 to 30 feet, with a height sometimes of 50 feet, and specimens exist supposed to be nearly 2000 years old. In India it is recorded 100 feet high, but with girth of 15 feet only. The sapwood is whitish, the heartwood is reddish brown, compact, hard, and heavy. It is strong, elastic, takes a beautiful polish, and is used for all kinds of turnery, for carving, and other purposes which require a firm and elastic wood. Whip-handles are made of the branches, and from time immemorial the Y. has been the principal wood used for bows. The succulent fruit has a sweet mawkish taste, but is not unwholesome. Though goats, rabbits, and sheep eat the leaves without injury, they are poisonous to cattle and horses, and in the human subject have a similar effect to digitalis. The western Y., *T. brevifolia* of N.-W. America, is a stately tree with a beautifully white or slightly yellow wood as close and fine-grained as the European species. The Indians use it for their bows. The allied genus *Torreya* bears the name of stinking Y. on account of the leaves and wood emitting a disagreeable odour when bruised or burned. The timber of *T. taxifolia* and *T. myristica* is heavy and close-grained.

Yezd, chief town of a province of the same name in W. Persia, in a large oasis on the confines of the great desert of Khorasan, 230 miles E.S.E. of Ispahan. The desert surrounds it on the N., E., and S., but on the W. a series of small oases connect that of Y., which is watered by the Mehris, with the more fertile districts E. of Ispahan. Y. is of great importance as a commercial centre, being the crossing-point of several great caravan routes—viz., those from Herat and Meshd, from Ispahan and Shiraz, and from Kirman. It thus becomes an entrepôt for the commerce between India, Turkestan, and Western Asia. Silks, cottons, carpets, felt, velvet, and sugar-candy are manufactured and largely exported. Pop. about 40,000, of whom many are Guebres, or fire-worshippers.

Yg′drasil, in the Northern Mythology (q. v.) the giant ash-tree symbolising the whole universe. It had three roots, one in the world of men, another among the Hrimthurser, the third over Niflheimr, while its branches stretched over the whole world and enveloped the heaven.

Y Moth (*Plusia gamma*), a species of *Lepidopterous* insect, well known in Britain and on the Continent, and derives its name from the presence of a mark on the front wings resembling the letter Y or the Greek gamma (γ). The Y M. is one of the day-flying moths, and its larva, a caterpillar, feeds on the pea, bean, turnip, cabbage, and other vegetables. Occasionally in France the larvæ are very destructive to gardens and crops. The average length of the moth is one inch.

Yo'ga ('junction,' from the same root as the Lat. *jungo*), one of the six schools of Hindu philosophy, upon which is based the practical duty of asceticism. Its one doctrine is the constant and intense concentration of the mind upon the Supreme Being, by which a 'junction' is effected between the individual and the universal spirit. Unnatural postures, suppression of the breath, a hermit life, and forced trances are inculcated as means towards this end. The modern Sivite ascetics, who practise horrible austerities, are commonly known as Yogis. The name of the reputed founder of the school is Patanjali. See *A Contribution towards an Index to the Bibliography of the Indian Philosophical Systems*, by Dr. Hall (Cal. 1859), and Monier Williams' *Indian Wisdom* (Lond. 1875).

Yokoha'ma, the principal seaport and the third city of Japan, on the E. side of the island of Nipon, upon Yeddo Bay, and separated from Kanagawa by Y. Bay, 18 miles S.W. of Yeddo by rail. Its harbour is spacious and supplied with commodious piers, and is the scene of an active foreign and coast trade. The junk transports have now almost entirely disappeared before the superior facilities afforded by small steamers and by the railway to the capital, which has been open since June 12, 1872. Y. is connected by telegraph with the other open ports, as also with the island of Yesso since September 15, 1874. The town is well built and regular, though the houses are almost entirely of wood. Fires are very frequent; the most disastrous of late years occurred in 1873 and in 1874. Y. dates its prosperity from its being opened to foreign trade by the Yeddo Treaty (August 26, 1858), as in 1859 it was still a small fishing village. A great part of the trade which formerly passed through Kanagawa (q. v.) has been transferred to Y., but as the former is still the seat of the foreign consuls, the trade of Y. is included in its returns. The port of Kanagawa was entered in 1877 by 309 vessels of 367,755 tons (151 of 151,641 tons British), and cleared by 302 of 360,285 tons (142 of 143,799 British). The imports amounted to $19,490,485, including cotton manufactures ($1,027,237, woollen wares $2,890,382, and metals $1,157,078); the exports to $15,628,337, including silk ($10,043,413, tea $12,613,188, rice $797,439, and copper $389,765). On December 31, 1877, there were within the district of the British consul at Kanagawa, 185 foreign firms and 2501 foreign residents (1142 Chinese, 570 British, 189 Americans). Pop. of Y. (1872) 61,553.

Yonge, Charlotte Mary, born at Otterbourne, Hampshire, in 1823, earned her popularity by *The Heir of Redclyffe* (1853) and *The Daisy Chain* (1856), two High Church novels, which have reached in 1879 their 23d and 15th editions, and whose profits were mainly devoted to fitting out a missionary schooner for Bishop Selwyn and founding a college at Auckland in New Zealand. Since then Miss Y. has edited the *Monthly Packet*, and published some 60 volumes more of novels, history, biography, and miscellaneous works. Among them are *Landmarks of History* (3 vols. 1852–57), *Heartsease* (1854), *History of Christian Names* (1863), *Dove in the Eagle's Nest* (1866), *Cameos from English History* (3 vols. 1868–76), *Life of Bishop Patteson* (1873), *Pillars of the House* (1873), *My Young Alcides* (1875), *Three Brides* (1876), *Beginnings of Church History* (1877), *The Disturbing Element* (1878), and *Primer of French History* (1878).

Yonk'ers, a town of New York, U. S., on the Hudson, 17 miles N. of New York by rail. It has 14 churches and 3 weekly newspapers. There are three wool hat factories, 4 carpet factories, 3 silk factories, machine factories, &c. The assessed value was in 1875 $20,906,904. Many New York merchants have handsome villas here. Pop. (1875) 18,357.

Yonne, a department of Central France in the basin of the Yonne (q. v.) and its tributary the Serain. Area, 2868 sq. miles; pop. (1876) 359,070. The surface is an undulating and richly-wooded plain, varied with chalk hills and table-lands, and in the S.W. by a considerable range. The soil is very fertile. Wine and corn are the two chief products. Iron is found in abundance; also anthracite, quartz, granite, marble, and good building-stones. There are some foundries, woollen mills, cloth mills, tanneries, lace and paper factories, and iron-works. Auxerre (q. v.) is the capital.—**Y. River** rises in Nivernais, and flows N. and then N.W. through Y. to the Seine, receiving on the left the Nievre, and on the right Eure, Serain, Armançon, and the Vannes. Its total course measures 169 miles, of which 72 are navigable. By the Nivernais canal it is united with the Loire; by the canal of Burgundy, with the Saône and Rhone.

Yoo'sufzye (*Yusufzai*, 'children of Joseph'), a numerous Afghan tribe, on the N.W. frontier of India, occupying about 2000 sq. miles within the British district of Peshawur and also the hills beyond the N. boundary. Their total number is estimated at 246,000, including 73.000 fighting men. Of these 80,000 are British subjects; 800 are serving the Bengal army, and 360 in the Punjaub irregular force. The crops of their territories are wheat, barley, millets, maize, cotton, and mustard-seed. The Y. export iron, cattle, and wool; and their transit trade is considerable. Those within British territory have become good subjects.

York (Lat. *Eboracum*; Old Eng. *Eoforwic*), the capital of Yorkshire and the seat of the Primate of England, ranks second among English cities, and gives its chief magistrate the title of Lord Mayor. It stands in a plain at a point where the three Ridings meet, and where the navigable Ouse receives the Foss, 191 miles N.N.W. of London by the Great Northern Railway, whose fine new station (erected outside the walls in Italian style 1873-77) is the largest in the world, the covered portion measuring 800 by 234 feet. Save for a gap of 500 yards on the eastern side, the ancient walls (kept up at a yearly cost of £150) run wholly round the city, and, having a circuit of 2¾ miles, afford a splendid promenade. With their ten 'bars' and posterns they mainly date from the 14th c., but retain some portions of Agricola's work, and follow for 3000 yards earthworks ascribed to Romanised Britons. Above the red-roofed houses, mingled with trees and gardens, the mighty Minster uplifts its central and two western towers, the one 216, the others 201 feet high, and all three in the same Late Perpendicular style (1404–70). Of Paulinus' Church (627) nothing remains but a few rough stones worked into the richly-channelled pillars of a Norman crypt (1070–1181), which itself is older than any portion of the superstructure—the Early English transept (1215–56), the Decorated nave and chapter-house (1285-1345), the Early Perpendicular Lady chapel and presbytery (1361–73), and the Perpendicular choir (1373-1400). The exterior is characterised by massive grandeur; within one is struck by the singular breadth and unbroken vista of a structure whose dimensions are 486 feet from E. to W., 223½ across the transept, and 104½ across the nave, the height of the latter being 99½, of the choir 102, and of the lantern 180 feet. Carlisle alone can offer a rival to the exquisite tracery of the western, Gloucester to the vast surface of the eastern window, each of them glowing with the original painted glass. The west façade has been pronounced 'more architecturally perfect than that of any other English cathedral;' other beauties of the Minster are its matchless octagonal chapter-house, its lancet 'Five Sisters,' the wealth of its ancient glazing, and its monuments of Archbishop Gray and Greenfield and of eleven more primates. Twice utterly destroyed by fire (741 and 1069), it lost the old wooden roofs of choir and nave, the stalls, and bells in two recent conflagrations, the first occasioned by a mad incendiary (1829), the second by a workman's carelessness. The cost of the two restorations amounted to £88,000; and in 1873–74 £20,000 was expended on the southern transept. Out of 58 ancient churches and chapels 23 survive—All Saints, North Street, with a spire 120 feet high, and rich in old painted glass, as also are St. Martin, St. Saviour, St. Denis, and St. Martin-cum-Gregory; St. Mary the Younger, a blending of many styles, from Primitive Romanesque to Decorated; St. Mary, Castlegate, with a spire of 155 feet; St. Michael-le-Belfre (1545), the church of Guy Faux's baptism, &c. Four modern Anglican churches were built during 1852–75, but the chief addition to the ecclesiastical architecture of Y. is the Roman Catholic pro-cathedral of St. Wilfrid (1864), an elaborate Italian Gothic edifice with a tower 147 feet high. In the grounds of the York-

shire Philosophical Society (established 1822), on the banks of the Ouse, stand the beautiful ruins of the mitred Benedictine abbey of St. Mary (1074). They comprise a 13th c. church and an hospitium (now used as a museum of antiquities); and near them are the Society's building, the Roman 'Multangular Tower,' the ruins of St. Leonard's Hospital (founded by Æthelstan, and rebuilt by Stephen), and the King's Manor (occupied by the Wilberforce school for the blind), which, built from the abbot's house for the Lords President, has memories of Strafford and the two first Stuarts. Here too a Fine Art Exhibition was opened May 7, 1879, whose Permanent Building, in Italian style, is 104 feet long, and contains a concert hall with a fine organ, picture-galleries, &c. Y. Castle, long since converted into the county jail, was thoroughly remodelled at a cost of £203,530 (1821-23), but its ruined 13th-c. Clifford's Tower retains some fragments of the Conqueror's masonry (1068). In the keep, whose site it occupies, 500 Jews slew first the women and children, then themselves (1190). Other noteworthy buildings are a Perpendicular guildhall (1446), the Mansion House (1728), Assembly Room (1736), the Decorated Micklegate (where the heads of Richard of Y. and other rebels were once impaled), and Monkgate, mixed Norman and Decorated, with an almost unique portcullis chamber. To these may be added the numerous medical, charitable, and educational establishments, the last including St. William's College (1460), a grammar-school (1546), and the Royal School of St. Peter (1557). The river trade and industries have lost their ancient importance, but iron-founding, brewing, tanning, and the manufacture of drugs, confectionery, combs, &c., are carried on, and the customs amounted (1877) to £13,179. Y. publishes three weekly newspapers, and returns two members to Parliament. Pop. (1871) 50,761. The ancient settlement of the Brigantes, converted into a Roman station by Agricola (*circa* 79 A.D.), rose to be capital of Roman Britain, and alone among British towns was the Cæsars' dwelling-place, where died Severus (211) and Constantius (306), and whence Constantine the Great went forth to Trier, York's sister imperial city this side the Alps. When from *Eboracum* it had changed to *Eoforwic*, Y. reappears as the Northumbrian capital, seat of the newly-converted Bretwalda, Eadwine of Deira, who here was baptized by the first bishop, Paulinus (627), and began the building of a church of stone. Then came the great Danish invasion (869), the city's alternate capture by Rægnald (923) and Æthelstan (937), lastly the choice of Eadgar the Peaceful to be King of the English (959), whereby the royalty of Northumbria, and so of Y., came to an end. In 1016 it submitted to Cnut; under Eadward the Confessor it witnessed the foundation of Earl Siward's church of St. Olaf, the revolt of the Northumbrians, and their massacre of Tostig's housecarls; in 1066 it received both Harold Hardraga and Harold of England; and in 1069 the sons of Swegen, with Eadgar Ætheling and Earl Cospatric, made the last Danish raid, sailing up the Ouse and putting the Norman garrison to the sword. The Battle of the Standard (1138) saved Y. from the hostile Scots, two of whose kings did homage here to Henry II. In 1298 one out of several parliaments was summoned to Y., where for seven years the Courts of King's Bench and Exchequer continued to sit, and which has been visited by almost every English king. The Wars of the Roses and Pilgrimage of Grace (q. v.) struck grievous blows at York's prosperity, and in 1644 the battle of Marston Moor forced its surrender to the Parliament. See works cited in King's *Northern Cathedrals* (Lond. 1869) and in Dixon and Raine's *Lives of the Archbishops of Y.* (vol. i. Lond. 1863), also Freeman's *Points in Early Northumbrian History* in *Macmillan* (September 1876).

York, a city and township of Pennsylvania, U.S., on Codorus Creek, at the head of Chesapeake Bay, 100 miles W. of Philadelphia by rail. It has 24 churches, a library, academy, granite court-house, 6 banks, 2 daily, 8 weekly, and 2 monthly papers. Iron-foundries, coach-works, whip manufactories, and shoemaking works are the chief industrial establishments. Pop. (1870) 11,003.

York, a river of Virginia, U.S., forming the tidal estuary of the united Pamunkey and Mattapony. From 1 to 3 miles broad, it extends E. for 40 miles to Chesapeake Bay. Y. Spit, at the mouth, is noted for its remarkable lighthouse.—**Yorktown**, 10 miles farther up on the right bank, is notable as the place where Lord Cornwallis surrendered with 8000 men and 235 guns on 19th October 1781. Here also during the Civil War the Confederate General Magruder was blockaded by General M'Clellan, 5th April 1862. The former, however, being reinforced by General Johnstone, was enabled to evacuate the works on 4th May with all his military stores. Pop. (1870) 1000.

York'shire, the largest county of England, lying between 53° 18'-54° 40' N. lat. and 2° 40'-0° 10' E. long., and bounded N.E. and E. by the North Sea, S. by the Humber and the counties of Lincoln, Nottingham, and Derby, S.W. by a corner of Cheshire, W. by Lancashire, N.W. by Westmoreland, and N. by Durham and the mouth of the Tees. Area, 3,882,851 acres; pop. (1871) 2,436,355. Y. has been from very early times divided into three 'Ridings,' viz., the East, North, and West, besides the 'Ainsty' or 'Liberty' of the city of York, and in statistical documents these divisions are treated as distinct counties. The East Riding occupies the S.E. portion of the county, and is separated from the West Riding by the Ouse, while the Derwent valley marks the division between it and the North Riding. It is divided into 6 *wapentakes* (corresponding to the hundreds of other counties), and has an area (including the City of York) of 804,798 acres, and a pop. (1871) of 269,505. The North Riding, occupying the N. portion of the county between the Derwent River and the county of Durham, and separated from the West Riding by the Ouse, the valley of the Ure, and the hills above Wharfdale, is divided into 13 *wapentakes*, and has an area of 1,361,664 acres, and a pop. (1871) of 291,589. The West Riding, occupying the W. and S.W. of the county, has 9 *wapentakes*, an area of 1,716,389 acres, and a pop. (1871) of 1,854,172. The most striking physical feature of Y. is the great central Vale of York, the northern portion of which is traversed chiefly by the Swale, which, rising among the south-eastern offshoots of the Westmoreland hills, flows E. and S.E., ultimately uniting with its sister stream the Ure to form the Ouse, one of the main constituents of the Humber. On both sides of this central vale the country rises, forming on the W. the Pennine range, and on the E. the Hambleton and Cleveland Hills of the North Riding and the Wolds of the East Riding. Between the Cleveland Hills and the Wolds lies the region known as the Marishes, a tolerably level district forming the valley of the Derwent, which flows S.W. to the Ouse. The Wolds seldom exceed 600 feet in elevation, and are much divided by deep winding valleys, while to the S.E. they are succeeded by the flat Holderness district, whose low exposed coast trending N.W. from Spurn Point to Bridlington Quay offers a marked contrast to the precipitous cliffs which in great part form the coast line to the N. of Flamborough Head. The western portion of the North Riding, bordering on the lofty Westmoreland moors, is much wilder than the eastern portion, which rarely exceeds 1400 feet in elevation. The chief heights are Shunner Fell (2346), High Seat (2328), Wild Boar Fell (2325), Rogan's Seat (2204), and Nine Standards (2153). Further S., in the N.W. corner of West Riding, rise the peaks of Ingleborough (2361), Pen-y-ghent (2231), Great Whernside (2414), Dent Crag (2253), &c., from whose eastern flanks flow the Nidd, Wharfe, and Aire, tributaries of the Ouse. The Calder, a feeder of the Aire, and the Don, have their sources on the southern watershed of the South Y. moors, which continue the Pennine range towards Derbyshire. The geology of Y. is very varied. In the W. small portions of Silurian and Old Red occasionally crop up, but over the whole district to the W. and S.W. of the Vale of York the Carboniferous system has a prodigious development. The limestones and shales which form the mountain masses in the N.W. of the county are succeeded towards the S.E. by Millstone Grit, which extending S. along the Y. border-land separates the coalfields of Lancashire from those of Y. and Derbyshire. To the E. of these is a comparatively narrow strip of red marl and magnesian limestone, which runs N. through the Vale of York, closing the Palæozoic succession. In concentric arcs from near York to the mouth of the Tees are arranged the Bunter and Keuper Sandstones of the New Red and the Lias Clays and Marlstones, on which rest the Oolitic formations of the Hambleton and Cleveland Hills. The Lias also skirts round the N.E. coast, and trends S.S.E. towards the Humber in a narrow strip, which is bounded on the E. by the Cretaceous formations of the Wold Hills. The Holderness district, and a considerable extent of country just above where the Y. water system combines to form the Humber, consist of alluvium deposits. The Cleveland Hills are rich in Oolitic iron ore;

the Mountain Limestone of the North Riding yields valuable lead deposits; while towards the S. lie the famous coal districts of Leeds, Wakefield, Sheffield, &c. With such a variety of geological structure there must exist considerable diversity in the climate and soils of diffeient localities as well as in the natural mineral products. The eastern portion has a cold and bleak climate, and is suitable for agriculture only in the more sheltered districts. The Vale of York is generally mild and temperate. The extensive levels in the S. are damp and foggy, but in the more elevated western regions the climate is salubrious, though heavy rains and tempestuous weather prevail. In the East Riding the principal industries are the agricultural. Horses and cattle are largely bred, and wheat and potatoes extensively grown. In 1878 it had under cultivation 672,208 acres, of which 278,320 acres were under corn crops, 108,346 acres green crops, 86,780 acres grass under rotation, 175,880 acres permanent pasture, 1717 acres under flax (chiefly at Patrington); while the stock consisted of 40,103 horses, 80,019 cattle, 508,326 sheep, and 53,130 pigs. At Beverley are agricultural iron-works and tanneries, at Hull extensive shipbuilding, linseed-crushing, oil-refining, and sail-making. The North Riding is principally agricultural in its lower half. In 1878, of its area there were under cultivation 839,888 acres, of which 220,463 acres were under corn crops, 77,247 acres green crops, 74,732 acres grasses under rotation, 436,931 acres permanent pasture; while its stock included 40,874 horses, 149,141 cattle, 697,872 sheep, and 53,771 pigs. In the Cleveland district there are more than 50 mines, employing 7000 miners, which yielded in 1876 5,614,322 tons of iron ore, valued at £1,694,918. For pig and manufactured iron there were, in 1878, 97 furnaces, 694 puddling-furnaces, and 37 rolling-mills. In 1877, 75 furnaces in operation produced 1,374,582 tons of pig-iron. Shipbuilding is carried on at Middlesborough, South Stockton, and Whitby, where alum and jet are also produced. Within the West Riding, in 1878, there were under cultivation 1,181,377 acres, 237,541 acres of which were under corn crops, 93,185 acres green crops, 89,470 acres grasses under rotation, 738,798 acres permanent pasture; while the farm stock consisted of 53,792 horses, 238,108 cattle, 742,431 sheep, and 75,776 pigs. Within it were (1878) 431 collieries, which yielded 15,952,400 tons of coal, 5 Bessemer steel-works, 290 puddling-mills and 40 blast-furnaces, of which the 30 in operation yielded 229,027 tons of pig-iron. Its various and enormous industries are thus localised: coal-working at Barnsley, Leeds, Wakefield, Rotherham, and Sheffield; iron at Leeds, Sheffield, Rotherham, Bradford, and Wakefield; steel at Sheffield and Rotherham; cutlery of all kinds at Sheffield; cotton-spinning at Bradford, Skipton, Settle, Halifax, and Hebden Bridge; worsted at Bradford, Keighley, Halifax, and Wakefield; alpaca at Bradford and Saltaire; woollens at Bradford, Leeds, Halifax, Huddersfield, Wakefield, Dewsbury, and Batley; flax at Leeds and Gildersome; carpets, rugs, blankets, army clothes, and shoddy at Dewsbury, Batley, and Heckmondwike; glass at Castleford and Knottingley; washing-machines at Keighley, and the growing of liquorice at Pontefract. In 1874 the total number of factories for textile fabrics in Y. was 1865, with 8,572,594 spindles and 115,387 looms, the number of hands employed being 222,026. The worsted manufacture alone employed 114,386 hands, 2,312,447 spindles, and 65,789 looms. In 1876, 23 mines yielded 4198 tons of lead ore, 2969 tons of lead, and 8850 ounces of silver. The great abundance of coal and iron—the 'natural commodities' of the district; the peculiar formation of the country, yielding abundant 'water privileges;' and, lastly, the character of the inhabitants, 'sleath-hounds in pursuit of money,' industrious and intelligent beyond the average of Englishmen, have combined to bring Y. to her present high state of prosperity. No part of England of equal extent with Y. contains so many sites and buildings of historic interest. It is sufficient to mention Northallerton, the scene of the 'Battle of the Standard' (1138); Wakefield, of that between Queen Margaret and the Duke of York (1460); Marston Moor, near Tadcaster, where Cromwell's Ironsides first broke the cavalry of Prince Rupert (1644); 'Merry Barnysdale,' near Doncaster, one of the favourite haunts of Robin Hood; and Bolton Castle, the prison for some time of Mary Stuart. Early British remains are numerous in the Cleveland Moors, and Roman at York, Aldborough, Catterick Bridge, Bowes, and Malton. The most interesting buildings are the Cathedral at York; the ruins of Kirkstall, Selby, Roche, Fountains, Byland, Rievaulx, and Whitby abbeys; Bolton and Knaresborough priories; and the ancient castles of Conisborough, Cawood, Knaresborough, Pontefract, Richmond, Middleham, Helmsley, Wressle, and Clifford's Tower at York. See G. Phillips Bevan, *Tourist's Guide to the West Riding of Y.* (Lond. 1877) and his *Tourist's Guide to the East and North Ridings of Y.* (Lond. 1878); and Hughes, *Geography of Y.* (Lond. 1878).

Yor'uba, or **Yarr'iba**, a country of W. Africa, lying between the kingdoms of Dahomey, Benin, and Gando. Its northern portion, which is subject to Fulah Mohammedans, is open and well cultivated, resembling a great garden. To this region there succeeds, on the S., an undulating, wooded country, which in turn merges into the dense belt of primeval forests which, as on the Gold Coast, separates the coast district from the interior. The coast natives are pagans of a debased type, but are improving under the efforts of missionaries. The total pop. of the country is estimated at about 3,000,000, and several of the towns are of large size. The chief are Abeokuta (q. v.), Ilori (60,000), Oyo, and Ibadan. The last is a walled town 18 miles in circumference, and with a pop. of 150,000. Palm-oil, cotton, and ivory are the staple products of the country, whose foreign trade is carried on chiefly through the British colony of Lagos (q. v.).

Yosem'ité Valley, a remarkable granite region in the centre of California, U.S., 150 miles E. by S. of San Francisco. It runs N. and S. midway between the E. and W. bases of the Sierra Nevada, here 70 miles broad, and is itself level, 6 miles long, from ½ to 1 mile broad, and depressed about 1 mile below the surrounding country. The Merced, joined through deep cañons by the Tenaya Fork and the Ililhouette, winds through the valley. On its N. side projects the granite mass El Capitan (3300 feet high), and on the opposite side stand the Cathedral Rocks, with the beautiful Bridal Veil Falls, which descend in a vertical sheet (630 feet), then falling in a series of cascades 270 feet lower. The Y. Creek Fall, also on the N. side of the valley, consists of a vertical fall of 1500 feet, then a descent in cascades of 626 feet, and a final plunge of 400 feet. Also noteworthy are the Vernal and Nevada Falls (400 and 600 feet) on the Merced River, and the Half-Dome Rock towering 4737 feet above the valley. The Y. V. was discovered in 1851. In 1864 it was given by Congress to the State of California 'for public use, resort, and recreation.'

Youghal (Ir. Gael. *eóchaill*, the 'yew wood'), a seaport of Cork, province of Munster, Ireland, at the mouth of the Blackwater, 27 miles E. of Cork by rail. There is an Episcopal church (partly dating from 1464), a Roman Catholic church, convent, hospital, &c. Myrtle Grove, the house of Sir Walter Raleigh, is still well preserved. Y. has a good harbour, a considerable trade in agricultural produce, and extensive fisheries. In 1878 there entered 321 vessels of 26,109 tons, and cleared 320 of 25,505, and on 31st December there were 30 sailing ships of 3703 tons registered as belonging to the port, besides 51 fishing-boats. In 1877 the value of the imports was £5980 (£15,627 in 1873). Y. returns one member to Parliament. Pop. (1871) 6039. Some of the old 'yews' that once covered the slope on which the town stands still remain. See Joyce's *Irish Names and Places* (vol. i. 1869).

Young, Arthur, born at Bradfield, Suffolk, September 7, 1741, son of the rector of the parish, was educated at Lavenham school, and in 1758 apprenticed to a wine-merchant at Lynn. Disliking the business, he made various essays in literature, and in 1759 he succeeded his father in the management of a small farm. This farm he left for a larger in Essex, the lease of which he was afterwards glad to get rid of at a loss. In 1768 he began his agricultural publications with *A Six Weeks' Tour through the Southern Counties*, and this popular work was followed by *A Six Months' Tour through the North of England* (1771, 4 vols.). Of the same period are his *Farmer's Tour through the East of England* (1770–71, 4 vols.) and several lesser performances. In 1784 the first of forty-five volumes of the *Annals of Agriculture* appeared, and in 1787 he began a tour in France, which resulted in his most widely read book, *Travels during the Years 1787–90* (Dublin 1793). This thorough piece of work is not only the accepted authority on French agriculture of the time, but furnishes stores of valuable information regarding the social ferment preceding the Revolution. Y.'s other works are *The Expediency of a Free Exportation of Corn* (1769), *The Farmer's*

Guide in Hiring and Stocking Farms (1770), *Rural Economy* (1770), *A Course of Experimental Agriculture* (1770), *The Farmer's Letters to the People of England* (1771), *Proposals for Numbering the People* (1771), *Political Arithmetic* (1774; 2d pt. 1779), *Tour in Ireland* (1780), *The Question of Scarcity plainly stated* (1800), *Essay on Manners* (1804), *Advantages from the Board of Agriculture* (1809), *Inquiry into the Progressive Value of Money* (1812), *Inquiry into the Rise of Prices in Europe* (1815). Some of these have been translated into Russ, and many into French (*Le Cultivateur Anglais*, 18 vols. Par. 1800-1). In 1789 Y. became secretary of the Board of Agriculture. He died at Bradfield, April 12, 1820.

Young, Brigham, the founder of the Mormon settlement in Utah, and for many years the almost absolute ruler of the sect, was born at Whitingham, Vermont, 1st June 1801. His father was a farmer, and he himself learned the trade of a painter and glazier. Early in life he joined the Baptists, but when about the age of thirty was converted to Mormonism, and openly joined the sect at Kirkland, Ohio, in 1832. In 1835 he was ordained an elder and sent forth among the twelve apostles, the New England States being the district assigned to him. Here he is said to have been very successful in his proselytising labours. On the death of Joseph Smith in 1844 he was unanimously chosen President and Prophet, though he had three competitors for the office, one of whom, Sidney Rigdon, he soon afterwards excommunicated. On the forcible expulsion of the sect from Nauvoo (see MORMONISM) he led them through toils and dangers, which nothing but the most admirable energy could have conquered, over the plains and table-lands to the splendid valley in the heart of the Rocky Mountains, where, between the Wasatches and the Great Salt Lake, he founded (July 1847) the present Salt Lake City. His immediate followers forming a nucleus, others poured into 'the Promised Land,' and in 1849 an attempt was made to organise a State, to be called the State of Deseret, that being the official name given by the Mormons to the district. The United States Government refused to sanction the new State, but Utah was organised as a Territory, and Y. appointed Governor for four years. The appointment of a 'Gentile' governor in 1854 led to serious troubles, as Y. and the other Mormons refused to recognise his authority, and it was not until a force of 2500 troops was sent out in 1857 that the United States Government could enforce its forms upon the turbulent sectaries. Y. was the founder of polygamy as an institution, and was among the first to practise it. In 1852 he promulgated the 'celestial law of marriage,' which he declared to have been revealed to Joseph Smith nine years before. A large party, among whom were Smith's wife and sons, in the Church opposed the innovation, and declared the revelation to be a forgery, but Y.'s influence carried the day. He himself had from fifteen to eighteen actual wives, besides numerous spiritual wives who were formally 'sealed' to him. He was twice indicted for polygamy, but each time the case fell through. His fifteenth wife sued for a divorce in 1875. The barbarous Mountain-Meadow Massacre of 1858 was brought to the notice of the law in 1875. In it a train of 136 emigrants, who had in some way come into collision with the Mormon settlers, was practically exterminated, only a few children being allowed to escape. The court exonerated Y. from complicity in the affair, though the suspicion was never satisfactorily cleared away, but 'Bishop' Lee, a leading Mormon, was condemned to death in 1876, and shot in March 1877. On the 29th of August in the same year Y. died, at the age of seventy-six, leaving 7 widows and 44 children. He was a man of undoubted ability, strength of character, and shrewdness; but even if we make allowance for the peculiarity of his opinions, seems to have had little principle, and to have been swayed strongly by a rather sordid ambition.

Young, Charles Mayne, born January 10, 1777, was the son of a London surgeon eminent in his profession, but brutal to his family. During a visit to an uncle at Copenhagen, Charles so captivated the king that the monarch offered to educate and provide for him if he became a naturalised subject. This offer being declined, he was educated at Eton and the Merchant Tailors' School. After a short experience in a mercantile house, he went on the stage at Liverpool as Douglas in 1798. Next year he was engaged to 'lead' at Manchester. In 1804 he played lovers' parts in Liverpool with Miss Grimani, whom he married in that city, March 9, 1805. This lovely and estimable wife died in the following year. Charles Y. made his first appearance in London as Hamlet; and amid the tumultuous applause accorded to his performance the only hiss was that of his malignant father. Thenceforth he rivalled Kemble—some say, imitating him too much. His stately style, of what we call the Classical, though it is a highly artificial type, contrasted so well with Edmund Kean's that the two often played alternately in the same parts with much pecuniary gain. Up to 1829 he enjoyed uninterrupted favour on the stage and in society. In that year he was tempted to play in America by an offer of £12,000 for ten months. He declined the proposal, however, and at the age of fifty-three retired from his profession with a competency of £60,000. He died at Southwick, near Brighton, June 28, 1856. See *Life of Charles Mayne Y., by his Son, the Rev. Julian Y.* (2d ed. 1871).

Young, Edward, an English poet, only son of Edward Young, rector of Upham, Hampshire, was born at the rectory, June 1681. He was educated at Winchester and at New College, Oxford, where he obtained a fellowship of All Souls in 1708. In 1719 he took his degree as doctor of civil laws. Already he was noted for some genius and a lack of common-sense that often brought ridicule upon him. Report says that when he was composing he would shut up his windows and sit all day by lamp-light, surrounded by skulls and instruments of death. His first poetical essay was an inconsiderable *Epistle to the Right Honourable George Lansdowne* (1712). Next year he prefixed some verses to Addison's *Cato*, and published *The Last Day* and *The Force of Religion*. In Swift's *Rhapsody on Poetry* occur two lines which insinuate that at this time Y. was a pensioned writer on the Court side. On the death of the Queen (1714) he published a panegyric that equally included the new monarch, George I. From part of a letter of Y.'s to Richardson it has been supposed that the poet was once in Ireland, and probably his visit was made in the company of Lord Wharton in 1717. Two years later he wrote *Busiris*, an ambitious tragedy in the artificial French manner. It contains, amid much ranting nonsense, passages of true poetic beauty, and its style hit the humour of the day at Drury Lane. His *Paraphrase on Part of the Book of Job*, which dilates and therefore weakens the original, and a poetical letter on Addison's death, belong to this period. In 1721 a tragedy called *Revenge* followed *Busiris*, and was dedicated to Y.'s most generous benefactor, the Duke of Wharton. Its lofty imagery, its sustained passion, and its minute depiction of guilt, place this tragedy far above its predecessor. Y.'s Satires next appeared under the title of *The Universal Passion* (1725-28), and brought him £3000. The *Satires*, particularly that on women, are full of acute reflections; but Swift was right in wishing that they could have been more angry or more merry. Next to these comes the *Instalment* (1726), an absurd effusion addressed to Sir Robert Walpole; and the new king, who encouraged the navy in a royal speech, was welcomed in an *Ode to Ocean* (1728). In 1728, Y., having entered holy orders, was appointed chaplain to George II.; and his tragedy of *The Brothers*, then under rehearsal, was withdrawn. In the same year he published in prose an *Estimate of Human Life*, and a sermon on Charles the Martyr, entitled *An Apology for Princes*. In 1730 he produced *Imperium Pelagi*, a naval lyric, and obtained the living of Welwyn, in Hertfordshire. Next year he married a widow, Lady Elizabeth Lee, daughter of the Earl of Lichfield. A *Sea Piece* was followed in 1734 by *The Foreign Address*. Both are poor appeals to the taste of sailors. Y.'s great work, *Night Thoughts*, was published in parts from 1742 to 1744. 'The title of my poem,' he writes, 'is not affected; for I never compose but at night, except sometimes when I am on horseback.' Warton says that Y. wrote this sombre poem in opposition to the earthly philosophy of Pope's *Essay on Man*. Its gloomy theology, its many profound reflections, and its imagery, often false but sometimes sublime, together produce an effect of grand solemnity; nevertheless the feeling of its reader is such as he would experience at a gorgeous religious celebration, of the hollowness of which he was convinced. The author wrote *Reflexions on the Public Situation* in 1745, and in 1754 *Centaur not Fabulous*, a series of letters on fashion. In 1759 appeared a prose letter on Original Composition, and shortly before his death he printed a poem on Resignation. He died at Welwyn, April 9, 1765. That Y. had a poetical genius can no more be denied than that he led a life of refinement in society; but such are his bombastic tendencies as a

poet, and such were his petty, time-serving characteristics as a man, that posterity grudges him his due meed of praise. See Mitford's Life, prefixed to his Aldine edition of Y. (2 vols. 1844).

Young, The Right Hon. George, a distinguished Scotch lawyer and politician, eldest son of Alexander Y., of Rosefield, in the county of Kirkcudbright, was born in 1819, educated at Dumfries and Edinburgh, passed advocate in 1840, and soon won a high position at the Scotch bar. During 1862-66 and 1868-69 he held the office of Solicitor-general. In 1869 he was appointed Lord Advocate, and signalised his tenure of office by an Education Act (1872), which for the first time in the history of the nation made primary education universal and compulsory. Y. sat in Parliament for the Wigtown Boroughs from 1865 to 1874, when he was defeated at the general election in February, but was immediately after created a Lord of Session, and one of the Lords of Justiciary in Scotland. His judicial career has been characterised by a brusque vigour, and a surprising celerity in the despatch of legal business.

Young, Thomas, M.D., a celebrated natural philosopher, was born at Milverton, Somersetshire, June 13, 1773. After completing a general and comprehensive education, and acting for some years as private tutor, he removed to London in 1792 to study medicine. He continued his studies at Edinburgh (1794), Göttingen (1795), and Emmanuel College, Cambridge (1797-99). His doctor's degree he obtained in 1807. Meanwhile, in 1800 he had settled in London with the design of becoming a medical practitioner. Having been left a considerable fortune by his uncle, Dr. Brocklesby, he did not push his practice, and had ample leisure for his favourite literary and scientific pursuits. Already in 1799 he had communicated a paper on experiments on sound and light to the Royal Society; and later papers on the theory of light and colours were selected by the council for the Bakerian Lectures. In 1801 he was elected professor of natural philosophy at the Royal Institution, but resigned after two years. His lectures there form the substance of his *Course of Lectures on Natural Philosophy and Mechanical Arts* (1807), a new edition of which, with references and notes by the late Professor Kelland of Edinburgh, was published in 1845. In these lectures physical and mechanical principles are discussed with great originality and power; and the one upon the interference of light has coupled the author's name for ever with that of Fresnel (see UNDULATORY THEORY OF LIGHT). In 1809-10 Y. lectured on medical science at Middlesex Hospital, and in 1811 became one of the physicians of St. George's Hospital, a post which he held till his death. In 1816 he was secretary to the commission for considering the standards of weights and measures, and in 1818 became secretary to the Board of Longitude, ultimately, on the dissolution of that body, taking sole charge of the *Nautical Almanac*. In 1827 he was elected one of the eight foreign associates of the French Academy of Sciences. He died May 10, 1829. Y.'s contributions to the *Philosophical Transactions*, and other scientific and literary publications, were collected and published under the title of *Miscellaneous Works of the late T. Y., M.D. F.R.S., &c.* (3 vols. 1855), of which the first two, including his scientific memoirs, were edited by Peacock; the last, comprising the hieroglyphical essays and correspondence, by Leitch. See *Memoirs of the Life of Thomas Y.* (Lond. 1831), and Peacock's *Life of Thomas Y.* (Lond. 1855).

Y'pres, or **Y'pern**, an old and, until lately, strongly fortified town of Belgium, capital of the province of W. Flanders, on the Yperle, 55 miles by rail S.W. of Bruges, with which, as well as with Ostend and Nieupoort, it is also connected by a canal. Two splendid edifices are the Gothic cathedral of St. Martin, dating from the 13th c., one of the finest churches in Belgium, containing the grave of Bishop Jansen; and the stately town-hall (formerly a cloth-hall) in the great market-place, extending 462 feet by 50 feet, with a fine clock-tower and spire in the middle, and forty-four statues along the front. It was built 1200-1304, and was restored in 1860. Y. has a college, a public library, a picture-gallery, a museum of antiquities, and several hospitals. Its only important industry now is lace-making. Pop. (1874) 15,515. Y. originally sprung up about a fortress built by Baldwin III., Count of Flanders, in 960. In 1388, Philip the Bold, Duke of Burgundy, enlarged the town and surrounded it with walls. It had then 4000 looms and a population of 200,000, and was one of the greatest towns in the Low Countries. It was fortified by Louis XIV. in 1688, and has since suffered several sieges. See M. Alphonse Vandenpeereboom's *Ypriana* (vol. i. 1878), which consists of curious notices, studies, and documents of the city in old times.

Ypsilan'ti, a Fanariot family claiming descent from the Comneni. Its most conspicuous members are (1) **Alexander Y.**, born 1725, a dragoman of the Porte, hospodar of Wallachia from 1774 to 1782, and again in 1790. He was carried prisoner to Brünn in 1792. Released, he returned to Constantinople, propounded a scheme for the fusion of the Greek and Turkish people, but having incurred the suspicion of the Porte was executed in 1805.—(2) **Constantine Y.**, his son, born in 1760 at Constantinople, early planned the freedom of Greece. His scheme was prematurely discovered, and he fled to Vienna. Pardoned by the Sultan, he was hospodar of Moldavia from 1799 till 1805, when he went to Russia, but returned to Bucharest with 20,000 men, again bent on freeing Greece. But the peace of Tilsit interrupting his plans he returned to Russia, and died at Kiev, 28th July 1816.—(3) **Alexander Y.**, eldest son of the preceding, born at Constantinople, 12th December 1792, followed his father to Russia, entered the army, and served with distinction in various campaigns. In March 1821 he entered Moldavia, and raised the standard of revolt among the Roumanians. Russia, however, frowned on his enterprise; the natives were apathetic, and he was defeated by the Turks at Dragaschan, near Galatz, 19th June 1821. He fled to Austria, and was interned at Munkacs in Hungary. He died at Vienna, 31st January 1828.—(4) **Dimitrios**, brother of the preceding, born 25th December 1793, served in the Russian army, and in 1821 went to the Morea, where he played a brilliant part in the struggle. But though a brave soldier and a successful general, as his victory at Tripolitza and his splendid defence of Argos show, his influence was constantly undermined by the 'native' party, who never forgot that he was a Fanariot, and therefore half a foreigner. In 1827, however, he was made commander-in-chief of the Greek army, but the unhandsome treatment he received from the Government of Capo d'Istria compelled him to resign his post, 1st January 1830. He then withdrew from public affairs, and died at Nauplia, 16th August 1832.

Yss'el, or **Ijss'el**, the name of several rivers in the Netherlands. The **Nieuw-Y.**, one of the principal arms of the Rhine, leaves that river below Arnheim, flows N.E. for 16 miles to Doesburg, where it receives the **Oude-Y.** from Westphalia, then N.E., N., and N.W. through Gelderland and Overyssel, past Zutphen and Deventer, receiving the Borkel and Schip-Beek, emptying at Kampen by many arms into the Zuider Zee, and forming a constantly widening delta. It is one of the five main arms of the Rhine, is 320 feet broad at Zutphen, 764 at Kampen, and is 90 miles in length. The **Neder-Y.**, an arm of the Leck, which leaves that stream at Vianen, flows W. through Utrecht, at Oudewater enters S. Holland and flows S.W. past Gouda to join the Maas, forming at its mouth the island of Ysselmonde.

Ystad', a seaport of Sweden, on the extreme S. coast, 55 miles E.S.E. of Copenhagen, and 85 N.N.E. of Stralsund. It has two churches, and manufactures of tobacco, chicory, sugar, soap, cloth, and leather. Y. has a good harbour, is in regular steamboat communication with the chief Baltic ports, and is connected with the S. Swedish Railway by a branch line opened in 1866. There is considerable trade, chiefly in corn (1½ million cubic feet exported in 1874). Pop. (1876) 6663.

Ytt'rium, a rare metal existing in combination and invariably associated with corresponding compounds of erbium, cerium, lanthanum, &c., in gadolinite, yttrocerite, and other of the rarer minerals found chiefly in Sweden and Norway. By a succession of chemical operations Y. and erbium are at length separated together in the form of nitrates; and further separation of the Y. requires a tedious process of fractional crystallisation, the erbium salt being the less soluble, and crystallising first. Metallic Y., containing some erbium, was obtained by Berzelius as a blackish grey powder; but metallic erbium has never been isolated even thus far. *Yttria*, the oxide of Y., has the composition YO, and is a soft whitish powder, which when ignited glows with a pure white light yielding a continuous spectrum crossed by bright

bands. A similar spectrum is given by ignited erbia (EbO), which burns with an intense green light. Solutions of erbium salts give absorption spectra, whose dark bands correspond to the bright lines of the erbia emission spectrum; solutions of Y. salts are colourless and exhibit no absorption spectra.

Yucatan′, a state of the Mexican Confederation, occupying the greater part of the peninsula of Y., has an area of 29,567 sq. miles, and a pop. (1875) of 422,365, of whom five-sixths are pure Indians. The coasts are low, girdled with sandbanks, and unbroken on the N. and W. except by the Laguna de Terminos, but possessing some good bays on the E. In the interior there is a want of water. The climate is hot, but not unhealthy. Maize, rice, tobacco, sugar-cane, coffee, cotton, and indigo are grown; tropical fruits abound; but the great wealth of the land lies in its valuable forests, including most of the dyewoods employed in European industries, and most kinds of wood required for artistic work and fine domestic furniture. Cattle, except swine, are not numerous. The honey and wax of the Y. bees are very highly esteemed. The chief harbours are Campeachy (q. v.), Sisal, Carmen, and Bacalar. The capital is Merida (q.v.). Y. contains numerous remains of a vanished civilisation. Of its ruins of great buildings (called by the Indians *xlapatlı*, 'old walls') the most celebrated are near Uxmal, to the S.W. of Merida. See Cogolludo, *La Historia de Y.* (Madr. 1687; new ed. Campeachy and Merida 1842–45); Norman, *Rambles in Y.* (New York 1844); Stephens, *Incidents of Travel in Central America, Chiapas, and Y.* (new ed. Lond. 1854).

Yucc′a, the botanical name for a genus of *Liliaceæ*, popularly called Adam's Needle. The number of species is about 12, chiefly found in subtropical N. America. Some are of an arborescent habit, producing a crown of linear-lanceolate, more or less rigid leaves, from the centre of which arises an erect panicle of showy, whitish, bell-shaped flowers. Most of the species are hardy in Britain, and *Y. gloriosa* and *Y. filamentosa* are commonly grown as ornamental garden plants. From the Y. leaves, when treated like hemp and flax, a strong fibre suitable for manufacture into cloth or cordage is obtainable, and the macerated stems deposit a feculent matter which yields starch.



Yucca filamentosa.

Yule, the old name for Christmas, still used in Scotland and N. England. It is the same as the Old Norse *Jól* (the festival of the winter solstice, Goth. *jiuleis*, Old Eng. *geól*, *geóhol*, Dan. and Swed. *jul*), which was called after the burning *wheel* that symbolised the circle of the year. The Greenlanders of the present day have a feast at the winter solstice to rejoice at the return of the sun, and Wormius (*Fast. Dan.* lib. i.) tells us that in his time the Icelanders dated the beginning of their year from Y. Some consider Y. almost certainly identical with *gule* in the phrase 'gule of August' (the first day of August), both being derived from the Celtic *wyl* or *gywl*, 'a holiday.' On the eve of Y. our ancestors were wont to light up candles of an uncommon size, and lay a log of wood on the fire, called a 'Y.-log' or 'Christmas Block,' to turn night into day. This custom still survives in the N. of England. In 1684 Herrick tells in his *Hesperides* how the Y.-log of the new Christmas was wont to be lighted 'with last year's brand,' and already in the same year its 'blazes' are condemned by Warmstrey as 'foolish and vaine; and not countenanced by the Church.' See CHRISTMAS; also Atkinson's *Glossary of the Cleveland Dialect*, p. 588 (1868), Grimm's *Deutsche Mythologie*, Brand's *Popular Antiquities* (re-edited by W. Carew Hazlitt, Lond. 1863).

Yunnan, the most S.W. province of the Chinese Empire, has lately been attracting much attention as a channel of trade from Burmah. It lies among the mountains N. from Independent Burmah, and S. of the windings of the Ta-Kiang or Great River. A large portion of the inhabitants are Mohammedans, called Panthays (q. v.) by the Burmese, and of uncertain origin. In 1855 they rebelled against the exactions of the Chinese viceroy, and being assisted by the hill tribes on the frontier, succeeded in establishing an independent government. But in 1871 the enormous resources of the Chinese empire proved successful, and the Panthays found their own principle of extermination turned against themselves. Y. is now entirely restored to Chinese rule. The export and transit trade in 1854 was valued at half a million sterling, and is now again about the same. Y. is known to be rich in gold, silver, lead, iron, copper, tin, mercury, arsenic, and gypsum. The Indian Government have twice tried to open a trade route. In 1868, Colonel Sladen proceeded as far as Momien, but the Panthay rebellion was then at its height. Again in 1875, Colonel Browne advanced with an armed escort from Burmah, but the Expedition was stopped by the sad murder at Manwyne of Mr. Margary, who had just marched through the whole of China alone and unhurt. In 1877 Lieutenant Gill followed the same route, and his example has since been emulated by a Scotch missionary. See *The Journey of A. R. Margary from Shanghae to Bhamo and back to Manwyne* (Lond. 1876).

Yunx. See WRYNECK.

Yu′thia (*Ayodhya*), the former capital of Siam, 40 miles N. of Bangkok, is almost encircled by the Méinan, whose fisheries furnish the town its principal employment. The German Mandelslohe in the 15th, and Portuguese Mendez Pinto in the 16th c., described the marvels of this 'Venice of the East;' but in 1768 it was razed to the ground by the king of Ava, and of its famous structures there only remains the 'Golden Mountain,' a neighbouring pyramid 400 feet high, with a gilded colossal statue of Buddha. The modern town is the summer residence of many Bangkok merchants, and has an estimated pop. of 40,000, including many Chinese and Burmese.

Y′vetot, a small town of France, department of Seine-Inférieure, 21 miles W.N.W. of Rouen by rail, with dyeing, manufactures of silks, cotton, linen, ticking, fustian, and velvet, and an export trade in corn. Pop. (1876) 8444. Y., with a small surrounding district, formed formerly a sovereign principality, popularly termed the 'Kingdom of Y.' The royal title was apparently first assumed by the lords of Y. in the 14th c., and was confirmed by Louis XI. in the 15th c., though tradition points to its origin in a grant of the Frankish king, Chlotar I., as an expiation for the murder at Soissons (534) of Walther de Y. In 1681 the French Parliament divested the territory of its sovereignty, but declared it a free commonwealth, whose lords subscribed themselves 'Princes d'Y.,' and whose inhabitants were exempted from taxes, an immunity which remained till the Revolution. Beranger's song, *Le Roi d'Y.*, is well known. See Duputel, *Le Royaume d'Y.* (Rouen 1835).

Z.



The twenty-sixth and last letter of the English alphabet, occupying the same position as in Latin. The Semitic Zain and the Greek Zeta had a much earlier place. It is properly a double consonant compounded of S and D, but has acquired the pronunciation of the hard terminal S (q. v.). Examples of its interchanges are—Zeus, Diespiter, and Jupiter; zealot and jealous; Gr. *zugon* = Lat. *jugum*, Eng. 'yoke.' At the beginning of words it generally indicates a Greek origin. In a certain class of English derivatives from the Greek ending in 'ize,' and in words formed on the analogy of such derivatives, modern orthography substitutes S. for Z.

Zaan'dam, or **Saar'dam**, a town of the Netherlands, in the province of North Holland, at the confluence of the Zaan with the Y., 4 miles N.W. of Amsterdam. It is divided by the Zaan into East and West Z., and is so intersected by canals that many houses with their gardens form little islands. Z. has several churches, manufactures paper, colours, starch, tobacco, and glue, and carries on shipbuilding and fishing. With the products of its corn, oil, and saw mills, it carries on a considerable trade with the Baltic, White, and Black Seas. Of the famous sixty docks of Z. in the 17th c. most are now closed. At Z. Peter the Great (q. v.) learnt shipbuilding as a common artisan. The house he lived in is still preserved, and bears a stone tablet inscribed *Petro Magno Alexander* (1814). Z. was the starting-point of the Dutch Greenland fishery, now wholly closed. Pop. (1875) 12,392.

Zab'ern, the name of three German towns, (1.) **Z.** or **Elsass-Zabern** (French, Saverne), a town of Elsass, Germany, on the Zorn, 27 miles N.W. of Strassburg by rail. A Gothic Hauptkirche of the 15th c., a castle built in 1667, but now a barrack, and a museum with a collection of local antiquities, are the principal buildings. The Rhine and Maine Canal passes through the town. Tanneries, potteries, and woollen-mills are the chief industrial establishments, and there is considerable timber trade. Z. stands at the mouth of the Z.-Pass, leading across the Vosges Mountains. Pop. (1875) 6201. The Roman *Tabernæ*, this town still contains traces of Roman occupation. It was long an ecclesiastical city belonging to the bishops of Metz, and an episcopal palace occupied the site of its present castle. Always a German town, though held for a time by France, it receded to Germany in 1871, and the castle, formerly occupied by the widows of members of the Legion of Honour, was employed as a barrack. See Fischer's *Geschichte der Stadt Z.* (Zab. 1874). (2.) **Brog-Zabern**, a town of Rhine Bavaria, on the Erlenbach, 8 miles S. of Landau by rail. Pop. 2000. (3.) **Rhein-Zabern**, a town of Bavaria, on the Erlenbach, 4 miles E. of Berg-Z. The Austrians were defeated here by the French 29th July 1793. Pop. 1800.

Zacate'cas, capital of the province of Z., Mexico, 350 miles N.W. of Mexico. It has several fine churches, a college with a library of 10,000 vols., mint, and bazaar. Situated 7741 feet above sea-level, Z. is literally built on silver, and the whole country teems with veins of silver ore, little worked. Pop. (1875) 16,000.—**Z.**, the province (area, 26,833 sq. miles; pop. 397,945), consists chiefly of a desert plateau, rich in metals.

Zachari'as, originally a Syrian monk, succeeded Gregory III. as pope, 741, and occupied the papal throne till 752. By his favourable reply to the famous inquiry of Pippin the Short (q. v.) he laid that monarch under an obligation to the Papacy which he fully repaid by twice saving Rome from the Lombards (q. v.).

Zadonsk', a town of Voronej, Russia, on the Don, 50 miles N. of Voronej. It has some trade and manufactures, and a remarkable cloister. Pop. 7200.

Zafaran'-Bo'li, a town of Anatolia, Asiatic Turkey, on the Chati-su, 190 miles N E. of Scutari. It has 5 mosques, a church, baths, khans, &c. The trade in saffron, here very extensive, has given the place its name. Pop. 15,000.

Zaffre. See COBALT.

Zähr'ingen, the house from which the present grand-ducal family of Baden takes its origin. The name is derived from the ruined castle of Z., in a village of the same name 2 miles N. of Freiburg in Baden. The first founders of the family were from the 8th to the 10th c. Counts of Breisgau, but the authenticated history of the house really begins with Bertold I., 'the Bearded,' who became Duke in 1050, was much esteemed by the Emperor Heinrich III., and received from him the reversion of the duchy of Swabia. He was, however, passed over in 1057 by Agnes, the widow of Heinrich III, in favour of Rudolf of Rheinfelden, and received in 1061 as compensation the duchy of Kärnthen with the march of Verona. He became reconciled with Rudolf in 1070, and fought by his side at Melrichstadt, August 7, 1078. When he saw from Limburg the devastation of his lands by Heinrich IV. he became insane, and died soon after—November 8, 1078. His elder son, Hermann, had died in 1074, leaving a son, Hermann II., who married Judith of Baden, and from whom the present house of Baden is directly descended. The younger son of Bertold 'the Bearded,' Bertold II., Duke of Z. (died 1111), inherited the dominions of his father-in-law, Rudolf of Swabia, and was followed by Bertold III. (fell at Molsheim, 3d March 1122), the founder of Freiburg. His brother and successor Konrad, who founded Münster, was made in 1127 by the Emperor Lothar, 'Rektor' of Burgundy, where his son Bertold IV. (died 1186) and his grandson Bertold V., the founder of Bern (1191), received rich possessions. As Bertold V. died childless (February 18, 1218), his dominions fell to the nearest heirs, the Dukes of Teck, who sprang from a brother of Bertold IV., and the elder Baden line. His Swabian possessions fell to his elder sister Agnes, the wife of the Graf von Urach, and his Swiss lands mostly to his younger sister Anna, wife of the Graf von Kiburg. The remainder, including the towns Zürich, Bern, Solothurn, and Offenburg, fell by testament to the Emperor. See Leichtlen, *Die Zähringer* (Freib. 1831); Vierordt, *Badische Geschichte im Mittelalter* (Tüb. 1865); and Cohn, *Stammtafeln zur Geschichte der Deutschen Staaten* (Brunsw. 1871).

Zaire, a name given to the great African river Congo in part of its lower course. As the important discoveries of Mr. H. M. Stanley regarding this river have been made known since the article CONGO was published, they may be noted here. Mr. Stanley descended the river from Nyangwé, in 4° 25′ S. lat., where it is called the Lualaba, almost to its mouth, the journey extending from 5th November 1876 to 11th August 1877. The identity of the Lualaba with the Congo being thus established, the river is found to have its origin in Lake Bangweolo (q. v.), whence it issues as the Luapula, and flows into Lake Moero, on emerging from which it is called the Lualaba. Frequent cataracts bar its channel, though the stream is 2000 yards broad, until in 2° N. lat., the river, which had hitherto flowed N., turns N.W., subsequently W., and finally S.W., its width increasing to from 5 to 10 miles, except in occasional gorges, while its bosom

is studded with great numbers of islands. About 400 miles from the sea there commences a series of sixty-two cataracts, by which the stream descends 585 feet in 180 miles, and below these are the Yellala Falls (see CONGO). The affluents of the Congo are of great size, especially on the left or S. bank, the chief of these being the Rumani, Sankorra, Kassai, and Kwango. The Kassai rivals the main stream itself in volume, and their waters do not commingle for 130 miles. On the right bank the chief tributaries are the Aruwimi (supposed to be the Welle of Schweinfurth), Mangola, and Mpaha. From the point where it emerges from Lake Bangweolo the total length of the Congo is estimated at about 2350 miles. It flows through a rich and thickly-peopled country, but the natives in many parts are extremely hostile, and some of them are cannibals. Missionaries have already begun to labour amongst them. Mr. Stanley proposes to change the name Congo to Livingstone, in honour of the great explorer. See H. M. Stanley's *Through the Dark Continent* (Lond. 1878).

Za'ma, or **Zama Regia**, a fortified city of ancient Numidia, 300 miles S.W. of Carthage. On 19th October, 202 B.C., it was the scene of a great battle, in which Hannibal was totally defeated by Scipio Africanus. This result was chiefly due to the great superiority of the Roman army in cavalry, under Lælius and the Numidian King Masinissa. Even the possession of 80 elephants by the Carthaginians did not make up for the lack of cavalry, and they were routed with a loss of 20,000 men, including all the veteran troops, Hannibal himself only escaping by flight. The Roman loss was 2000. This battle ended the Second Punic War, and practically settled the fate of Carthage. Z. is now called Zouarin, or Zowareen, and is an insignificant place. See Bosworth Smith's *Carthage and the Carthaginians* (Lond. 1878).

Zambe'si, or **Zambe'se**, the largest river disemboguing on the eastern side of Africa, and probably the fourth largest stream on that continent. Though it had been known by report for many centuries, and though its mouths had been in the possession of the Portuguese for fully 250 years, scarcely anything definite was known regarding the Z. prior to Dr. Livingstone's journeys in 1852 and succeeding years, and even yet its upper course remains unexplored. The Z. is supposed to be formed mainly by the confluence of three streams, viz.:—(1) The Lungebungo, which rises in the Mossamba Mountains, which form the watershed between the Z. system, the rivers flowing W. through Angola to the Atlantic, and those flowing N. to join the Congo. (2) The Leeba, which issues from Lake Dilolo, about 12° S. lat., 17° 40' E. long. (3) The Leeambye, which is believed to be the main stream, and which is supposed to rise in Cazembe's country about 70 miles S.W. of Lake Bangweolo (q. v.). This river flows S.W. to its confluence with the Leeba, then S., and finally in two great curves with an easterly direction, entering the Indian Ocean between 18°-19° S. lat., after a course estimated at 1200 miles, during which it drains an area of probably 600,000 sq. miles. The name Leeambye is retained as far as the confluence of the Chobe, which enters on the S. in 25° E. long., below which, to the commencement of its delta, the river is called the Z. The country through which the upper Z. flows is mainly a plateau from 3000 to 4000 feet above the sea-level, and depressed towards the centre. The river descends from this plateau by a gigantic crack in its basaltic rim, forming, a few miles below the confluence of the Chobe, the Victoria Falls, called by the natives Mosioatunya, *i.e.*, 'smoke sounds here.' The river, here 1860 yards broad, falls 310 feet perpendicularly into the crack mentioned, which is only 80 yards broad, and has a remarkable zigzag course. For 30 miles the river is confined between precipitous rocks, and forms in this part of its course the falls of Moamba, which, grand though they are, appear insignificant in comparison with the Victoria Falls. 460 miles lower down are the rapids of Kebrabasa, where the river runs in a deep rocky groove from 40 to 60 yards wide. In the rainy season the perpendicular rise of the water in this gorge is 80 feet. Below these rapids, from a point 35 miles above the Portuguese settlement of Tete (q. v.), or 355 miles from the sea, the Z. is navigable, though its navigation is difficult on account of the number of islands and sandbanks with which its channel is studded. In the dry season its average depth in this portion of its course is from 5 to 15 feet, and in flood-time from 15 to 30 feet, with a width varying from one to four miles. At its mouth the Z. has formed a delta in the shape of an equilateral triangle, with sides 80 miles long. Through this delta, which is a swampy, malarious region, the Z. discharges by four mouths, of which the Luabo is the deepest. All have dangerous bars at their entrances. The chief tributaries of the Z. on its left bank are the Kafue, Loangwa, and Shire (q. v.); and on the right bank the Chobe. The Z. forms a general, though not invariable, boundary-line between the pastoral races of Kaffir origin and the agricultural Negro peoples. The Makololo, a brown-skinned Bechuana tribe, occupy the central basin of the Z., and their capital, Linyanti, is situated on the Chobe. They hold in subjection the aboriginal inhabitants, who are called Makalaka, and are more numerous than their conquerors. Adjoining the Makololo kingdom on the east, and occupying the watershed between the Z. and the Limpopo, are the Matebele, a warlike Zulu tribe formerly ruled by the celebrated King Moselikatse. Fifty years ago they extended their conquests as far as the N.W. shore of Lake Nyassa, where they are known by the name of Mazitu or Mavitu. The coast tribes are of Negro origin. With the aid of steamers of light draught, one of which began running on the Shire and Lower Z. at the end of 1878, a large trade is likely to arise, the Z. valley abounding in land of the richest kind, well adapted to the growth of all tropical crops. Good coal is found over a very large area, and gold and silver are obtained near Tete and Senna, while the quantity of ivory exported is very great. The slave trade and Portuguese misrule are the chief hindrances to the development of this rich and vast region. See Livingstone's *Travels and Missionary Researches in South Africa* (Lond. 1857); *Narrative of an Expedition to the Z. and its Tributaries* (Lond. 1865); and Mohr's *Nach den Viktoriafällen des Z.* (2 vols. Leip. 1875; Eng. trans. Lond. 1876).

Za'mia, a genus belonging to the natural order *Cycadaceæ* (q. v.). It consists of arborescent plants resembling small palm-trees, with simple cylindrical stems, bearing at the summit a crown of thick pinnated leaves, and producing flowers in separate male and female cones. Z. is represented in tropical America, the W. Indies, and S. E. Africa. In S. Africa, where the natives use the central part of the stem of *Z. cycadis* for food, the name *Caffer-brood* is common among the colonists for the genus. In the Bahamas, the starchy matter from the stems of *Z. tenuis* and *Z. furfuracea* is made into a kind of arrowroot.

Zamios'trobus, a genus of fossil fruits from Mesozoic and Tertiary rocks. They are generally believed to be the cones of fossil Zamias. The Cycads, of which *Zamia spiralis* of Australia is a familiar example, have also been associated with Z.

Zami'tes, the name given to a genus of fossil Cycads, the remains of which occur in strata of Mesozoic age. Allied genera are *Podozamites* and *Pterophyllum*.

Zamo'ra, an old and decayed town of Spain, capital of a province of the same name, on the right bank of the Douro, which is here crossed by a splendid bridge, 55¾ miles W.N.W. of Medina del Campo by rail. Within the town, which is surrounded with high but dilapidated walls, are 22 churches, of which the finest are the Gothic cathedral, with its massive square tower and round Norman arches, and La Magdalena (12th c.), a church of the Templars. Z. manufactures woollens and linens, and has a large trade in wine and fruit. Pop. 11,469.

Zamorin, or **Tamurin** ('lord'), the hereditary title of the Hindu Rajah of Calicut, the most powerful of the native chiefs on the Malabar or W. coast of India with whom the Portuguese came into contact during the 16th c. After the defeat of Hyder Ali, the Z. acknowledged the supremacy of the E. India Company, and agreed to pay tribute. About the year 1800 he ceased to exercise independent jurisdiction; but his descendant, who still retains the title of Z., continues to live at Calicut.

Zamosc', a fortified town of Russian Poland, government of Lublin, on the Wieprz, 50 miles S.E. of the town of Lublin. It was laid out in 1588 in the Italian style by Jan Zamojski, and all its houses have arcades. Its fine castle, the four churches, the arsenal, and the town-house are the chief buildings. Pop. 6781.

Zamouse' (*Bos brachyceros*), a species of *Bovidæ* or Oxen occurring in W. Africa, and named the *bush cow* at Sierra Leone. The ears are specially developed, and a dewlap is absent. The colour is a pale brown; the horns curve outwards and then upwards and inwards, and have sharp tips; the hair is thin, and has a tendency to grow erect.

Zanes'ville, a city of Ohio, U.S., on the Muskingum, 59 miles E. of Columbus by rail. It has 26 churches, 19 schools, 1 daily and 5 weekly newspapers. There are glass-works, machine-shops, carriage-factories, rolling-mills, &c. Z. has water-works of unusual excellence. Pop. (1870) 10,011; estimated (1878) 20,000.

Zan'te, the ancient *Zakynthos*, one of the Ionian Islands, lies in the Ionian Sea, 9 miles W. of the N. part of the Morea and 7 miles S. of Cephalonia. It is 18½ miles long, has an area of 116½ sq. miles, and a pop. (1870) of 44,557. In the S.E. irregular rocky masses stretch down to the sea inclosing the beautiful bay of Chieri; the interior is more level, and is in a high state of cultivation. The beautiful scenery and pleasant climate of Z. have gained for it the name *Il fiore di Levante* ('the flower of the Levant'). The chief products of Z. are currants, which it yearly exports to the value of £480,000, oil, wine, melons, cotton, and silk, and of its woods are the olive, mulberry, and myrtle. The Zantiotes are mostly Greeks, with about 2000 Jews and some Turks, while the chief citizens speak Italian. Z. is much subject to earthquakes.—**Z.**, the capital, picturesquely situated on a bay in the E. of the island, is built all round its harbour (protected by a mole), and its houses, alternating with gardens, rise like an amphitheatre upwards of 100 feet to a wooded hill, on whose summit is the citadel built by the Venetians. The houses are well built, many of them furnished with ornamented arcades and minaret-like towers. Z. is the seat of a Greek archbishop and a Catholic bishop, and has several churches (the finest being the church of the Phæneromeni and that of St. Dionysius), chapels, and hospitals, a theatre, an exchange, and an arsenal, and in its market-place a colossal bronze statue of the Lord High Commissioner Maitland. There are considerable shipping and trade, and manufactures of cottons, hair-carpets, silks, linens, gold and silver ware, soap, and leather. The total value of its imports in 1877 was £171,648, and exports (chiefly currants and olive oil) £214,827. Pop. (1870) 17,516. *Zakynthos* (originally *Hyrie*) was peopled by Achæans from the Peloponnesus, and, according to Homer, belonged to Odysseus. After the fall of Athens, to which it had been subject, it adopted an aristocratic constitution. It then fell successively to the Romans, to the Eastern Empire, to Naples in the 13th c., and in the 14th to Venice, whose it remained till 1797, sharing thenceforth the fortunes of the Ionian Isles.

Zanzibar', or **Zanguebar** ('coast of the blacks'), a territory on the E. coast of Africa, including several islands of considerable size, and a strip of the mainland along the coast from 0° 10' to 10° 42' S. lat., or between Somali Land and the Portuguese territory of Mozambique, a distance of 1100 miles. The inland boundary of this strip is undefined, and on many parts even of the coast the Sultan of Zanzibar's authority is scarcely even nominal. The climate of the mainland is very hot, moist, and unhealthy for Europeans. The vegetation is rich, and tropical produce of all kinds might be grown in abundance. As yet, however, ivory, gum-copal, indiarubber, beeswax, hides, and orchella weed are the chief products of this undeveloped region, which has not yet recovered from the blighting effects of the slave-trade, which is still surreptitiously carried on to a considerable extent, though abolished by treaty on 20th June 1873. The chief towns or trading-posts are Bagamoyo, Kilwa, Mombasa, Malindi, and Lamo. The island possessions of the Sultan of Z. are as yet much the most important part of his dominions, and among them the chief are the islands of Z., Pemba, and Mafia, the area of which is 630, 227, and 200 sq. miles respectively. The first of these is about 25 miles distant from the mainland, is of coral formation, flat, and nowhere exceeds 300 feet in height. It possesses a rich soil, which, aided by a rainfall averaging 200 inches per annum, and a careful system of cultivation, yields plentiful crops; nevertheless, its capabilities of production are still far from being fully turned to account. The chief articles of produce are rice, millet, cloves, sesamum, oranges, cocoanuts, and the sugar-cane. The scenery of the island is of a charming description, beautiful green lanes traversing it in every direction; while the climate is much milder and healthier than that of the mainland.—**Z.**, the capital of the territory (called by the natives Ungŭja), is situated on the western shore of the island of the same name, and has a good harbour, with an extensive and growing trade, carried on chiefly with Britain, India, the United States, and France. The town is irregularly built, and the sultan's palace, a low coral edifice in a mixed Arabic and Italian style, is almost the only noteworthy building it contains. Arabs constitute the ruling class, while natives of India both here and throughout the territory of Z., almost monopolise both the retail and foreign trade. Their numbers were estimated at about 6000 in 1874, and are steadily increasing. Suaheli blacks constitute the bulk of the native population, and in addition there are Wakhadim (the aborigines of Z.), and a mixed population from Madagascar, the Comoro Islands, &c., with Gallas and Somalis in the northern districts on the mainland. The pop. of the town of Z. is estimated at 80,000, and that of the island at 380,000. No estimate can be formed of the pop. of the mainland possessions. Z. has been an Arab settlement since 924 A.D., and for several centuries formed a republic, governed by elders elected by the people. In 1503 it became tributary to Portugal, whose authority, never very well maintained, was finally shaken off in 1735. From 1784 to 1854 it formed part of the possessions of the Imaum of Muscat. On the division of these at the death of one of the Imaums in the year last mentioned, Z. and its dependencies became an independent kingdom, governed by a Seyyid, or 'lord,' commonly called the Sultan. The present Seyyid, Barghash bin Sa'eed, who succeeded to the throne on 7th October 1870, visited England in 1875. See *Z., City, Island, and Coast*, by Captain R. F. Burton (Lond. 1872), and Blue Books.

Za'ra, an Austrian seaport and the capital of Dalmatia, lies on the Adriatic, 129 miles S.S.E. of Triest. Its promontory is separated from the mainland by an artificial channel, and till 1873 was defended by strong fortifications, pierced by two gates, of which the Porta Marina is 'a Roman arch under a Venetian mask.' Of eight surviving out of 30 churches the chief are the Duomo of St. Anastasia (1285), a vast Romanesque basilica, with exquisite cinque-cento stalls and an unfinished campanile; the triapsidal St. Chrysogonus (1407) and St. Simeon's, with a gorgeous shrine, both of these also Romanesque basilicas; St. Mary's, Renaissance itself, but retaining a noble campanile (1105); and lastly, the desecrated, domed round church of St. Donatus, called by tradition a temple of Juno, but not described as such by Constantine Porphyrogenitus (911–59). The interest of Z. lies mainly in the churches, but two Roman columns may also be noticed, besides the former palace of the priors (now the governor's residence), the episcopal palace, and a public library of 20,000 volumes. The preparation of maraschino (200,000 bottles of which are exported yearly), glass-making, and fishing are the leading industries, and in 1876 the roomy, secure harbour was entered and cleared by 1173 vessels of 184,000 tons. Pop. (1869), without the garrison, 8014. Having under the first Augustus become a Roman colony with the name of *Jadera* (changed by the 10th c. to *Diodora*), Z. about 1000 passed from the Eastern Empire to Venice, and thenceforward its history consists of conquests and reconquests between the Island Republic and the Croatian and Hungarian kings; the crowning episode being its capture from Lewis of Hungary by the united arms of Venice and the Frank crusaders (1202). In 1409 the Venetians bought it of Ladislaus of Hungary for 100,000 ducats, and in 1797 it passed with Venice to Austria, which, after resigning it to France (1809), recovered it by a week's bombardment (1813). See Freeman's *Historical and Architectural Sketches* (Lond. 1876).

Ze'a. See MAIZE.

Ze'a (anc. *Ceos*), an island of the Grecian Archipelago, included in the nomarchy of the Cyclades, lies 13 miles to the E. of Cape Colonna. Area 34 sq. miles; pop. (1870) 8687. Oval in shape, it attains an elevation of 1863 feet in Mount St. Elias, and is of great fertility, its products including wine, honey, figs, and silk. The capital, Z. (anc. *Iulis*), stands 3 miles inland from its port, Limani, and among other fragments of antiquity retains a colossal rock-hewn lion, and had a pop. (1870) of 3789. Birthplace of the lyrists Simonides and Bacchylides, Z. belonged in the Middle Ages to the Duchy of Naxia, with which it fell into the hands of the Turks (1566), and was held by them down to the erection of the modern kingdom of Greece.

Ze'a, Francisco Antonio, born at Medellin in Colombia, 20th October 1770, for sharing in a revolutionary movement was imprisoned at Cadiz, Spain (1797–99), but in 1805 became Professor of Botany at Madrid, and by Joseph Bonaparte was

appointed Minister of the Interior and Governor of Malaga (1808–13). Retiring to S. America (1814), he joined Bolivar, and after rising to be Intendant-General of the forces, held the Vice-Presidency of Venezuela (1818–19). Ill-health, however, compelled him to revisit Europe, and having as minister-plenipotentiary concluded a Colombian loan of £2,000,000 with London bankers, he died at Bath, 22d November 1822.

Zebid', a town of Yemen (q. v.), Arabia, on the Zebid, 60 miles N. of Mocha. It is an old town, with a large mosque, and a considerable but declining trade. Pop. 8000. From 819–1022 it was the residence of a sheik, and for a hundred years the seat of a great Arab school.

Ze'bra (*Asinus* or *Equus Zebra*), a species of *Equidæ* or *Solidungula*, distinguished from the ass and horse by the black striped bands which ornament both body and legs. The colour is a whitish yellow. The stripes run at right angles to the axis of the region in which they occur. Thus, those of the body are vertical, while those of the legs are horizontal. The tail is somewhat tufted and there is a short bristly mane. The Z. is fierce, active, and untamable. It is wary and fleet, and succeeds in making its way in districts which would be well-nigh impassable to the horse and its neighbours. The Dauw or Burchell's Z., also named the Peechi, differs from the Z. in having no stripes on the lower limbs, while those of the body are not so black as in the true Z. The Quagga (*Asinus quagga*) wants the stripes seen on the legs in the Z. The ass and Z. will breed together, and when a mare has borne a colt to a Z. stallion, the subsequent progeny of the mare by ordinary horses are striped like the Z.

Zebu' (*Bos Indicus*), a species of ox representing the domestic cattle of India, and distinguished by a curious fatty hump borne on the withers of the animals. The dewlap is also well-developed, and hangs in a heavy fold from the throat. The back droops markedly towards the tail. The Z. race numbers several well-marked breeds. Some are not much larger than big dogs; others exceed the ordinary ox. The sacred Brahmin Bulls belong to the Z. race. The horns are short. The Z. is used as a beast of draught, and also for riding. It is said to carry its young for 300 days, the period of gestation in the common ox being 270. The Z. is found in India, China, E. Africa, and Madagascar.

Zebu', or **Oebu'**, one of the Bissaya group of the Philippine Islands (q. v.) E. of Negros. Area 2352 sq. miles; pop. (1874) 427,356. The capital, Z., is a well-built town with a fine cathedral and episcopal palace. It was declared an open port in 1842, and has been the seat of a British vice-consulate since 1865. The harbour can be entered in both monsoons, but the northern entrance is narrow. In 1877, 22 vessels of 14,982 tons were loaded here, of which 9 of 6688 tons were British. The exports were—sugar, 12,145 tons; tobacco, 1,666,600 lbs.; hemp, 25,582 bales; sapan wood, 72 tons. Their total value was £300,000. Pop. 8800.

Zeb'ulun (Heb. 'dwelling') was the tenth son of Jacob (Gen. xxx. 20), and the tribe numbered 57,400 at the first census, and 60,500 at the second (Numb. i., xxvi.). The territory of Z. was one of the richest and most beautiful sections of the land of Canaan, stretching across the country almost from the Sea of Galilee on the E. to the plain of Phœnicia on the W. In after times the tribe was distinguished for its warlike spirit (*cf.* Jud. iv. 6, 10; v. 18), scientific skill (Jud. v. 14; 1 Chron. xii. 33), and commercial enterprise (Gen. xlix. 13; Deut. xxxiii. 18, 19).

Zechari'ah, the author of the book in the Bible bearing that name, was a prophet in the time of Darius Hystaspes (i. 1, 7; vii. 1), being thus a contemporary of Zerubbabel, Joshua, and Haggai (*cf.* Ezra v. 1, 2; vi. 14). Chaps. i.–viii. contain a series of visions relating to the rebuilding of the Temple and the exaltation of Jerusalem. It has been debated in modern times, however, whether the latter part of the book (chaps. ix.–xiv.), which does not seem to have any visible connection with what goes before, was composed by this prophet, or by one or more prophets of an earlier time. Thus chaps. ix.–xi. have been ascribed to Jeremiah on the ground that Matt. xxvii. 9, 10, which does not occur in Jeremiah, is probably quoted from Z. xi. 12, 13. There seem to be grounds for believing, at anyrate, that the prophecies of this second part were composed before the time of Z., or before the Captivity, and were afterwards united with those of Z., the compiler believing that they proceeded from the same writer. This in turn has been explained by supposing that the earlier section was written by some one of the same name, which was a common one. There was one in the reign of Ahaz, *e.g.*, mentioned by Isaiah (viii. 2), whose father even bore the same name as the father of Z. (i. 1, 7). See Wright's *Z.*, &c. (*Bampton Lectures*, 1878).

Zech'stein, a technical term applied by German miners to a stratum of Dolomitic limestone immediately overlying the Kupferschiefer or Mergel-schiefer. The latter is a marl-slate, containing copper-pyrites, besides numerous fossils, and much worked in Germany as a valuable ore of copper. Both formations correspond to the Middle Permian of English geologists.

Zedeki'ah, the last king of Judah, was the son of Josiah (q. v.). Originally called Mattaniah, he received the name of Z. from Nebuchadnezzar, when the latter placed him on the throne in the room of his nephew Jehoiachim, who was sent off to Babylon. Thus placed at the helm of the state at a great crisis in its history, Z. showed himself wanting both in the wisdom and firmness necessary to guide it aright. Thinking to throw off the yoke of the Chaldæans by help of the Egyptians, he only brought on his country the power of the former to crush it. After a siege of a year and a half by the Chaldæan army Jerusalem was taken (B.C. 588), and Z., who had attempted to escape, was captured, blinded, and sent in chains to Babylon, where he died.

Zee'land, the most S.W. province of the Netherlands, bounded N. by South Holland, E. by North Brabant, S. by Belgium, and W. by the North Sea. Area, 681 sq. miles; pop. (1877) 187,046. Z. is made up of the islands lying between the mouths of the Scheldt, South, North, and East Beveland, Walcheren, Wolfaartsdyk, Schouwen, Duiveland, Tholen (with St. Philippsland), and the so-called 'States Flanders.' The soil of Z. is exceedingly fertile and well tilled, yielding rich crops of wheat, flax, and hemp. Horses, horned cattle, sheep, and swine are reared, and on the coasts many live by oyster and other fishing. The chief manufactures are madder and calico. Shipbuilding, brewing, distilling, and salt-refining are also carried on; and in 1875 the Z. fisheries employed 472 boats and 1026 men. The transatlantic trade of Z. has declined since the 18th c. in consequence of the sanding up of the harbours. It is hoped that trade will be improved by the new harbour at Flushing and the recent connection of Z. with the German railway-system by Breda and Boxtel. The chief towns are Middelburg (q. v.), Flushing (q. v.), Zieriksee (pop. 7617), and Goes (pop. 6063). Z. has been won from the sea since the beginning of the Middle Ages, and has been broken up into islands by subsequent inundations. It originally belonged to the German Emperor, of whom at one time the Counts of Flanders, at another those of Holland, held it as a fief. These counts became independent in the 10th and 11th centuries, and long struggled for its possession, till Florens V. of Holland obtained it in 1269 as a dowry with Beatrix, daughter of Guido of Flanders. United to Holland ever since, it was one of the United Provinces, and joined in 1579 the Union of Utrecht.

Zeithun', a district of Cilicia, Asiatic Turkey, inhabited by a body of Armenian Christians. It is fertile but mountainous, and the people, who are almost independent of Turkish authority, are distinguished by their martial spirit and their immunity from crimes of violence. There is also a town of Z., with a pop. of about 20,000. This singular community is a survival of the Armenian kingdom which subsisted in Cilicia from the 11th to the 14th c. A sanguinary conflict which took place here soon after the Crimean War first drew the attention of Europe to this people. It was put a stop to by the intervention of the British and French consuls. In the spring of 1879 the Turkish pasha, enraged at the depredations of some neighbouring marauders, sent troops against the city, and the intervention of the English consul at Beirut alone saved it from destruction.

Zeitz, a town of Prussia, province of Sachsen, on the White Elster, 261 miles S. by W. of Leipzig by rail. It has five squares, an evangelical cathedral, three evangelical churches, an ancient Rathhaus, a good library with valuable MSS. and 20,000 vols.,

an hospital, &c. Z. manufactures woollen and cotton goods, sugar, leather, gloves, earthenware, pianos, waxcloth, &c.; there are also corn-mills and distilleries. Pop. (1875) 16,480. For its interesting history see Roth, *Aus der Geschichte der Stadt Z.* (Zeitz 1876).

Zela'ya, a town of Guanajuato, Mexico, on the Rio Grande de Santiago, 120 miles W.N.W. of Mexico. It has a large and elegant cathedral, with several other churches. The suburbs are squalid, and are inhabited chiefly by Indians. Z. manufactures cotton. Pop. 11,000.

Zelko'na Tree, a name given to *Planera Richardi*, a large elm-like tree, native of the Orient. The timber is much prized, the heartwood when dry being exceedingly hard, capable of a fine polish, and is an excellent furniture wood.

Zell, Karl, a well-known humanist, born at Mannheim, April 8, 1793, studied philology at Heidelberg, Göttingen, and Breslau, and became professor in the Rastatt Lyceum in 1814, and in the University of Freiburg in 1821. Here he founded a school of philology in 1830, and in 1835 was nominated to the ministerial council. In 1847 he became Professor of Archæology at Heidelberg, and from 1848 to 1853 he sat in the Second Chamber of Baden. At the diet of 1851 with Hirscher he exerted himself to promote the greater freedom of the Church. In 1855 he retired from his chair, and died at Heidelberg, January 24, 1874. Z. edited a collection of Latin classics (17 vols. Stuttg. 1827-31), to which he himself contributed the Phædrus, the Horace, and the *De Republica* of Cicero. He next edited the *Ethica Nicomachea* of Aristotle (2 vols. Freib. 1833), and translated the *Organon* (5 vols. Stuttg. 1836-40). His chief works, however, are *Ferienschriften* (3 vols. Freib. 1826-23; new issue Heidelb. 1857), *Handbuch der Römischen Epigraphik* (3 vols. 1850-57), and *Li-oba und die frommen Angelsächsischen Frauen* (Freib. 1860). He also published *Ueber die Iliade und das Nibelungenlied* (Karlsr. 1843), and his course of university lectures as *Opuscula Academica* (Freib. 1857).

Zell'er, Eduard, a German Protestant theologian and philosopher, born 22d January 1814 at Kleinbottwar in Würtemberg, studied theology first at Tübingen under Baur, then at Berlin (1836-37), and settled as *privat-docent* at Tübingen in 1840. In 1842 he started the *Theologische Jahrbücher*, an influential organ of the Tübingen school. Z.'s extreme critical views excluding him from a Tübingen theological chair, he accepted in 1847 a call to be extraordinary professor of theology at Bern. Here his appointment excited great opposition on the part of the Conservatives, yet Z. maintained his position till 1849, when he became professor at Marburg. Transferred to the faculty of philosophy at the instance of his opponents, he laboured with growing success as professor of philosophy at Heidelberg from 1862 till appointed successor to Trendelenburg at Berlin (1872), a position which he still (1879) holds. His chief works are *Platonische Studien* (Tüb. 1839), *Die Philosophie der Griechen* (3 vols. Tüb. 1844-52; 4th ed. 1876 *et seq.*; Eng. trans. 3 vols. 1868-75), *Geschichte der Christlichen Kirche* (Stuttg. 1853), *Das Theologische System Zwingli's* (Tüb. 1853), *Die Apostelgeschichte kritisch untersucht* (Stutt. 1854; Eng. trans. 1875), *Vorträge und Abhandlungen Geschichtlichen Inhalts* (Leip. 1865, 2d ed. 1875; 2d series, 1877), *Staat und Kirche, Vorlesungen an der Universität Berlin* (Leip. 1872), *Geschichte der Deutschen Philosophie seit Leibniz* (Leip. 1873), *David Friedrich Strauss in seinem Leben und seinen Schriften geschildert* (Bonn 1874), a work preliminary to his edition of *D. F. Strauss' Gesammelte Schriften* (12 vols., Bonn 1876-78), *Ueber die Lehre des Aristoteles von der Ewigkeit der Welt* (Berl. 1878), and *Ueber die Griechischen Vorgänger Darwins* (Berl. 1878).

Zemindar' (*Zamîndâr*, from an Arabic word meaning land), the name universally given in India to the landlords, who have engaged to pay the government land-revenue, as opposed to the *Ryots* (q. v.), who are the actual cultivators of the soil. The *zemindary* system, as it is called, by which the State accepts from the Z. a permanently fixed sum as its quota of the produce of the soil, and disregards all other interests, is found in its fullest development in Bengal, where it was established by the Permanent Settlement of Lord Cornwallis in 1793; but it exists to a minor degree in Madras and other provinces. There is little doubt that under the Mogul administration the Z. was merely a government official, charged with the collection of the revenue, with no rights in the land. But this office, like all others under a weak Oriental government, tended to become hereditary; and it is not surprising that the English, partly from short-sighted motives of convenience, should have been anxious to import their own system of landlord and tenant into a country where the absolute proprietary right of the State in the soil had never before been questioned. In Bengal, at the present day, the Z. has all the rights of a British landed proprietor, subject of course to the payment of the land-tax, and also to a certain ill-defined 'tenant right' on the part of those cultivators who have been for a long time in possession of their farms. Comparatively few of the Zemindars are now the descendants of those with whom the Permanent Settlement was originally concluded, and the subdivision of property is proceeding rapidly, as also is the creation of subtenures. The land revenue of Bengal was fixed in 1793 at £2,858,772. The rack-rent now received by the Zemindars is perhaps tenfold that amount. About one-fifth of the area of Madras is held under a Z. tenure, yielding a fixed revenue of £513,299. The so-called Zemindars in other provinces are usually liable to a periodical enhancement of the land demand.

Zena'na, or **Zana'na** (Pers. 'belonging to women'), that part of a house which among Hindus of good caste is set apart for the use of women. In Bengal a native gentleman's house consists of an outer and an inner part. Each of these is in the form of a quadrangle. The former, well furnished, with fine rooms, and windows looking out upon the public street, is for the use of the men; the latter, of a mean and even squalid appearance, is devoted to the women, who may go into each other's rooms, or take an airing in the courtyard, but must not be seen in public. From 50 to 100 Hindu ladies are sometimes gathered together in this dismal prison-house. Till about twenty years ago no Christian woman was permitted to enter a Bengal Z. The Rev. J. Fordyce was the first to organise the Z. Mission there, and Mrs. Mullens, an accomplished authoress in the Bengalee language, developed the system. In all the great centres of city and intellectual life in India, thousands of Hindu, and in some cases Mohammedan, ladies are now systematically taught in their own homes by Christian ladies, native, European, and American. A Government inspectress in many cases reports on the secular instruction imparted, and grants-in-aid are given accordingly. The sole difficulty is to train a sufficient number of vernacular Christian female teachers to meet the demand. Thus ever-increasing efforts are being made to reach the Hindus of the next generation by bringing the light of the gospel to brighten the cheerless hearths of Hindu mothers.

Zend, the name given to the primitive language of the Persian race, in which the sacred books or Z.-Avesta (q. v.) are written. The word itself is of uncertain origin. According to Max Müller, it is identical with the Sansk. *khandas* (Lat. *scandere*), 'metre;' but the accepted derivation is from the Sansk. *gnati*, 'knowledge,' being thus the commentary of which the Avesta is the original text. From the point of view of comparative philology, Z. possesses an importance and interest second only to Sanskrit. Its discovery, or rather its successful decipherment, dates from the present century. Preserved only in the Z.-Avesta, it remained unknown, or at least unintelligible, to European scholarship, until the enthusiasm of a French traveller, Anquetil Duperron, brought back an imperfect translation of the Z.-Avesta from India in 1761. A learned Dane, Rask, followed in his steps, and published the first scientific treatise on the language in 1821. It was the great French philologer, Eugene Burnouf, who definitely assigned to Z. its true place among the offshoots of the august Aryan stock. Though existing in comparatively few fragments, much corrupted by dialectal decay, Z. is now admitted to take rank as an elder sister, more primitive than either Greek or Latin, and almost contemporaneous with Sanskrit. As a spoken language, it is thought to have become extinct in the 3d c. B.C. In richness of grammatical modifications, and in redundancy of forms for composition, as well as in general similarity of radical framework, it closely approaches the classical Sanskrit of the Vedas. In fact, the farther we trace back Sanskrit to its earliest forms, the greater is the resemblance between the two. The evidence of a common mythology and ceremonial also points to the conclusion that the Sanskrit-speaking Hindus and the Z.-speaking Iranians lived together under the generic name of Aryas in the N.W. of Hin-

dustan, long after the ancestors of the Greeks, Romans, Celts, and Germans had separated from the original hive on their march towards Europe. It has been plausibly conjectured that a religious schism, embodied in the creed of Zoroaster (q. v.), was the proximate cause of the subsequent divergence of the Iranian or Persian race. The near connection of the two languages may be inferred from the following facts: Many Z. words can be transliterated into Sanskrit, merely by changing the letters into their corresponding forms, the main difference being in the sibilants, nasals, and aspirates; *e.g.*, the *Sapta Sindhu* or Seven Rivers of the Vedas, becomes *hapta hendu* in the Z. Avesta. The forms of the two words 'India' and 'Hindu' show that we have derived them from 'Sindhu' through a Greek and Persian channel respectively. Up to 100 all the Aryan languages count in substantially the same numerals; but *sahasra*, Sanskrit for 1000, is only represented in the Z. *hazara*. If modern Persian stands to Z. in the same relationship that Italian does to Latin, then Z. and Sanskrit may be compared to two dialects of Classical Greek. The chief authorities on the philology of Z. are Burnouf, Bopp, Spiegel, Westergaard, West, and, above all, the late Dr. Martin Haug, for many years professor in the Poonah College, Bombay. For a popular explanation, see Max Müller's *Chips from a German Workshop*, vol. i.

Zend-Aves'ta, more properly **Aves'ta-Zend'** (usually interpreted to mean 'authorised text' and 'commentary'), the religious book of the Parsees (q. v.), or representatives of the old creed of fire-worshippers. The original is written in the primitive Zend (q. v.) language, with a translation into the comparatively modern Pehlvi (q. v.) made by order of the Sassanian dynasty, 235–651 A.D. In antiquity, the Z.-A. ranks second to the Vedas, while its language is also the nearest sister of the Sanskrit. Traditionally, the whole is regarded as the composition of Zoroaster (q. v.), to whom it was directly revealed. But modern scholarship is able to discriminate between different portions, and assign each approximately to its own period. The oldest part may possibly date back to 1200 B.C. What is now in existence is evidently but a very small portion of the complete work, which is reported to have consisted of 21 *nosks* or volumes, of which only one, the Vendidad, now survives in its entirety. In addition, the sacred text contains the Yazna, the Visparad, and the Yasht. These are mainly composed of hymns and sacrificial prayers, addressed either to Ormuzd or to the numerous archangels and powers of nature. The Yazna includes five Gathas or prayers—the only portion of the Z.-A. which modern criticism is disposed to assign to Zoroaster himself. The Vendidad, which has been called the Pentateuch of the Parsees, is a code of ceremonial observance, prescribing rules of purity for daily worship and the ordinary business of life. The general conception of the whole may be briefly described as Monotheism of a lofty type, tinged with traces of an earlier mythology, and gradually crystallised in the forms of sacrificial worship. At the present day, every Parsee child is taught to repeat long passages in the original Zend; but hardly a single word of that language is intelligible even to the Parsee priests or Dasturs. It has been the boast of Western scholarship to restore to the Parsees the right understanding of their own sacred book. The first translation into French by Anquetil Duperron, published at Paris in 1771, was received with scepticism by the greater part of Europe. It required the accurate philology of Burnouf to attract serious attention to the subject. His edition, the first of the original text, was published at Paris 1829–43. But the interpretation of the Z.-A. is still a matter of great doubt and difficulty. As compared with the Vedas, the total amount of Zend literature in existence is extremely scanty. What we do possess was handed down for centuries by oral tradition, then translated into a modern dialect of the same language, and finally preserved by the fidelity of a wandering priesthood, who now use Gujerathi, a Hindu dialect, as their vernacular. Under these circumstances, it is not surprising that rival scholars should often differ widely about the decipherment of certain passages. Sufficient has been definitely ascertained to render the study one of extreme interest and steady progress. See Dr. Martin Haug's *Essays* (1st ed. Bombay 1862); and Abel Hovelacque's *Grammaire de la Langue Zende* (Par. 1878); also Spiegel, *Avesta: die heiligen Schriften der Parsen, aus dem Grundtext übersetzt* (3 vols. Leip. 1852–63); Harlez, *Avesta, Livre Sacré des Sectateurs de Zoroastre* (Liege, 3 vols. 1875–78).

Zenick (*Suricata Zenick*), a species of Carnivorous quadruped, allied to the Ichneumon, and also named the 'Suricate.' It is found in S. Africa, attains a length of 18 inches, and resembles a weasel, but has longer legs. The colour is a greyish brown, marked on the back with cross bands of darker hue. The muzzle is sharp and the tail long, but sparsely covered with hairs. The Z. may be domesticated, and is a dreaded enemy of rats and mice. It also feeds on fruits.

Zen'ith, the point in the heavens directly above an observer, being thus the upper pole of the observer's horizon, and diametrically opposite the Nadir (q. v.).

Zenjan', or **Zengan'**, a town of Persia, province of Ajemi, on a tributary of the Kizil Uzen, 200 miles W.N.W. of Teheran. Girdled with old walls and orchards, it is an important place on the line between Teheran and Tabriz, and carries on a large trade in carpets, arms, and salt. Pop. 20,000.

Ze'no, the name of two Greek philosophers. (1) Z., the Eleatic, born about 500 B.C., was a follower of Parmenides. He attempted to support the position that only 'the one' or pure Being must exist, by a negative criticism against the possibility of multiplicity and motion. His arguments were advanced with great acuteness, and first directed attention to certain difficulties and antinomies involved in the infinite divisibility of matter, space, and time. (2) Z. (350–258), the founder of the Stoics (q. v.), was a merchant of Cittium, in Cyprus, who lost his all by a shipwreck, and thus forced to serious reflection, determined to apply himself to philosophy. He studied for twenty years under various masters, and then opened his school. He is said to have ended his life by Euthanasia. The Athenians, in admiration of his noble character, built his tomb at the public expense, and erected a monument on which the inscription was carved, 'His life corresponded to his precepts.' No philosophical doctrines in ancient times produced such noble fruits as those of the Stoics. The truest men in the Roman world were followers of Z. The latest writers of note on Z. of Cittium are Weygoldt (Jena 1872), Wellmann (Leip. 1873), and Wachsmuth (Gött. 1874).

Ze'no, Roman Emperor of the East (474–491), born of a noble family, married Ariadne, daughter of Leo I. (468), was preceded on the throne by his own son, Leo II., whom his father-in-law before his death recognised as his successor. For some time Z. was joint-ruler with, though subordinate to, his son; but on the death of the latter in 474 he became sole emperor. His reign was very unfortunate. The barbarians ravaged the empire on all sides, and his own subjects rose in revolt against his cruel and oppressive government. These rebellions were crushed by murder and bribery, but as often as they were crushed they broke out again, whilst the barbarians, who were continually attacking the empire, were bought off by disgraceful concessions. Z. died in 491, after a reign of seventeen years, and was succeeded by Anastasius, who married his widow. See Tillemont's *Histoire des Empereurs* (vol. vi.), Gibbon's *Decline and Fall* (chap. xlvii.).

Zeno'bia, queen of Palmyra (q. v.), succeeded to the throne as regent for her sons on the murder of her husband Odenathus, 266 A.D. Not content, however, with the independence granted by the indolent Emperor Gallienus and his successor, Claudius, she aimed at a dominion which should include Egypt, Syria, and Asia Minor, and make good her vaunted title of Queen of the East. The accession of Aurelian, however, in 270, once more placed a soldier at the head of the Roman empire, and in 273 the armies of Z. were defeated in two pitched battles, while Palmyra was taken and its queen made prisoner. According to Zosimus she died on her way to Rome, but according to Trebellius Pollio, whose narrative is much more particular, she was led in triumph through Rome in the train of Aurelian, and was afterwards presented by her conqueror with a villa at Tibur, where she passed the remainder of her life with her sons after the manner of a Roman matron. Z. was one of the most remarkable women of antiquity. She resembled Cleopatra in her talents and her personal fascination, but she far surpassed her in purity and elevation of character. 'She is,' says Gibbon, 'perhaps the only female whose superior genius has broken through the servile indolence imposed on her sex by the climate and manners of Asia.' See Von Sallet, *Die Fürsten von Palmyra unter Gallienus, Claudius und Aurelian* (Berl. 1867).

Zen'ta, or **Czen'ta**, a town of Bacs, Hungary, on the Theiss, 24 miles S. of Szegedin. It lies in a fertile country, producing abundant crops. Cattle are largely bred. Pop. (1869) 16,808. Prince Eugene defeated the Turks here in 1696.

Ze'olite (Gr. *zeô*, 'I boil'), a generic term applied to a very large family of secondary minerals, supposed to have been formed by the action of water upon the original constituents of volcanic rocks. They are all hydrated silicates, mostly of the alkalies and alkaline earths, and containing from 10 to 25 per cent. of water. They occur usually in cracks and crevices in traps and other ancient igneous rocks, and as typical examples may be mentioned Analcime, Apophyllite, Stilbite, and Natrolite. The name Z. is derived from the circumstance that all these minerals froth and bubble up when heated in the flames of the blow-pipe.

Zephani'ah (Heb. 'watcher of the Lord'?), a Hebrew prophet, flourished in the reign of Josiah, 7th c. B.C. He is the ninth in order of the twelve 'minor prophets.' His little book (of three chapters) predicts the desolation of Judæa as a punishment for the idolatry and worldliness of its inhabitants, calls upon it to repent, announces the destruction of its surrounding enemies, and ends with a declaration that God will make the righteous remnant of Israel 'a name and a praise among people of the earth.'

Zerbst (Wend. 'belonging to the Sserbski'), a town of Germany, Duchy of Anhalt, formerly capital of the principality of Anhalt-Z., on the Nuthe, 26½ miles S.E. of Magdeburg by rail. The chief buildings are the Nikolaikirche, dating from the 15th c.; the great Schloss, surrounded with a park; and the stately old Rathhaus, dating from the 15th c., but disfigured by additions in 1610, standing in the market-place, in the centre of which are the Roland Column (1445), and the Butterjungfer, a slender column bearing a female figure. Z. contains a gymnasium of high repute —the Franciseeum—and has manufactures of silks, plush, cloth, leather, gloves, gold and silver lace, soap, starch, essences, tobacco, chemicals, pottery, umbrellas, musical instruments, and machinery. Gardening, iron-founding, and beer-brewing are also carried on. Pop. (1875) 12,877.

Ze'ro, in physics, is any convenient point with reference to which quantitatively estimable phenomena of the same kind are compared. Thus, on the centigrade scale, the Z. of temperature is chosen as the temperature of freezing water; while the absolute Z. of temperature is a point determined by thermodynamic principles (see HEAT). In Electricity (q. v.) any object is at Z. potential when it is in contact with and is at the same potential as the earth. A Z. has the essential characteristics of what is known in analytical geometry as the origin.

Zeulenro'da, a town of Germany, in a detached portion of the principality of Reuss-Greiz, 10 miles W. of Greiz, has a large handsome *stadtkirche*, a beautiful *rathhaus* and hospital, with important manufactures of soap, machinery, cotton and woollen wares, especially hosiery, besides a considerable trade in cattle. Pop. (1875) 6900.

Zeus ('the god of the bright heaven') is the supreme deity of the Hellenic religion, the ruler of gods and men, 'whose eye sees all and knows all' (Hesiod), who, himself goodness and love, 'grants whatever he will in his mind, for he can do all things' (Homer). The original meaning of his name is clearly seen in such words like *Diosēmeia* ('portents in the sky'), *Diipetēs* (lit., 'fallen from heaven'), *endios* ('in the open air'), *eudios* ('well-skyed'), and the Latin *Sub Jove frigido, sub diu, sub dio, sub divo.* It is the same as the Sansk. *Dyu, Dyaus;* Lat. *Jovis*-pater, *Ju-* in *Jupiter*; O.H.G. *Ziu;* Old Eng. *Tuo* or *Tiu*, preserved in *Tiwesdæg*, 'Tuesday' (q. v.), the day of the Eddic god *Ty*. 'For good and for evil, Z. the Sky and Z. the God were wedded together in the Greek mind' (Max Müller). Throned in the upper æther Z. was worshipped by Hellenes of every clan. The tops of the highest hills of Hellas were sacred to him, and specially was Mount Lykaion, which overlooks all Arcadia, consecrated to his worship. In the earliest phase of the Hellenic religion, the cloud-compelling Z. blesses the thirsty fields with rain and dew (*cf.* the Roman *Jupiter Pluvius, Serenator*, and *Lucretius*), cherishes the woods, the hearths, and the flocks (*Z. Herkeios*). The oak-tree and the thunderbolt are his earliest symbols. In the Theogony of Hesiod Z. is the culminating point of the unfolding Kosmos, which, from abstract physical beginnings (*Okeanos, Chthōn, Chaos*), grows ever more concrete. He quells all hostile powers, and gives the world of gods and men its normal form. In Homer, Olympos, the snowy mount of Thessaly, is the throne of Z. 'the father, the most glorious, the greatest, ruling over all, mortals and immortals.' Æschylus and Pindar are the greatest exponents of Hellenic faith in supreme Z. With them he is the all-blessed lord of lords, the 'lord of infinite time,' the eternal father, who gives to all according to their deserts, who is full of mercy to the pious suppliant, of holy wrath against transgressors. 'Z.,' says Æschylus, 'is the earth, the air, the sky; Z. is all and above all.' 'He leads men in the way of wisdom; he orders that suffering should be our best school.' In relation to civil society, Z. is the embodiment of law and order, the guardian of friendly intercourse, of the state (*Z. Polieus*), of the rights of citizens (*Z. Horios*) and strangers (*Z. Xenios* and *Hikesios*), and in war he is the leader and the victor, the liberator and the saviour. In a wider political relation, Z. is the head of all unions and alliances. He is the chief patron of gymnastic contests, and of soothsaying, 'for he sees all things, and holds the future in his hands.' The oak-tree at Dodona and the Ammonium were his oracles, and at Delphoi he spoke by the mouth of the Pythian Apollōn. The mythic history of Z. grew out of many local traditions. Hesiod tells that he was born in Crete, whither Rhea had been conveyed by Gaia for fear of his father Kronos. Later writers state that the precise spot was a cave of Mount Ida there, and that he was nursed by Amaltheia (q. v.). When he grew up he freed the Cyclōpes (q. v.) and the Giants, and having overpowered the Titans (q. v.), gained the dominion of the world, which neither the Giants and Typhōn (q. v.) nor the Titanic intelligence of Promētheus (q. v.) could wrest from his grasp. Hēra is in Homer and the older poems generally the sole wife of Z., the oldest and greatest of the goddesses, but in Hesiod his first union is with *Mētis* ('wisdom'), after whom come Themis, Eurynomē, Dēmētēr, Mnēmosynē, and Hēra. The brother of Hestia, Dēmētēr, Hēra, Poseidōn, and Hadēs, Z. is the father of all the other gods and heroes that dwell in heaven, Athēna, Hēphaistos, Apollōn, Arēs, Aphroditē, Hermēs, the Dioskouroi, Perseus, and Hēraklēs. Themis, the Hōrai, the Muses, the Charites, and the Moirai are his attendant deities. The myths of the loves of the Sun, which the poets delighted to sing, are either based on country tales of the adventures of the Sun as the great fructifying principle, as in the case of Lētō, Io, Dēmētēr, Maia, Danaē, Kallistō, or owe their origin to the pride of families like the Aiakidai or the Hērakleidai. In artistic representations Z. appears either as a youth, or as a man in his prime, or as an old man. His statues express kingly majesty, and are usually either sitting or standing. In his most famous statue at Olympia by Phidias, Z. sat on a throne of gold and ivory 43 feet high, on a base 13 feet high. The chief representations of Z. now extant are the Otricoli mask, now in the Vatican; the bronze of Paramythia, in the British Museum; two statues at Florence, a bust at Vienna, and a number of wall-paintings found at Pompeii and Herculaneum, and now in the Museum at Naples. See Grote's *Greece* (vol. i.); Max Müller's *Lectures* (2d series); and Cox's *Comparative Philology*; Welcker, *Griechische Gottenlehre* (3 vols. 1857-63); Overbeck, *Griechische Kunstmythologie* (Leip. 1871); Hartung, *Die Religion und Mythologie der Griechen*, vols. i.-iv. (1873); Preller, *Mythologie*, vol. i. (3d ed. 1873); Von Sybel, *Das Bild des Z.* (Marburg 1876).

Zeuss, Johann Kaspar, the founder of Celtic philology, was born at Vogtendorf in Oberfranken, Bavaria, July 22d, 1806. From the Lyceum at Bamberg he passed to the University of Munich, where he devoted himself to philology and history. In 1839 he became professor of history in the Lyceum at Speier, and in 1847 in that at Bamberg. He died at Vorstendorf, near Kronach, November 10th, 1856. His historical works are, *Die Deutschen und die Nachbarstämme* (Münch. 1837), *Die Herkunft der Bayern von den Markomannen* (1839), *Traditiones Possessionesque Wizenburgenses* (Speier 1842), and *Die freie Reichsstadt Speier vor ihrer Zerstörung* (1843). His great work is his *Grammatica Celtica* (2 vols. Leip. 1853; 2d ed., by Ebel, Berl. 1868-71), which for the first time placed Celtic philology on a scientific basis.

Zeux'is, a famous Greek painter, probably born at Heraclea on the Euxine about 450 B.C., was of the Ionic school, and unrivalled in rendering types of sensuous beauty, though Aristotle says he failed in his attempts at high moral characterisation. His 'Helen,' executed for the Croton temple of Juno, and combining the perfections of five Croton virgins, was looked upon as the ideal type of beauty. Among his other masterpieces are his 'Hercules Strangling the Serpent,' 'Jupiter among the Gods,' 'Marsyas Bound,' and the 'Female Hippocentaur.' The well-known story of his contest with Parrhasius is of a piece with the tradition that he died of laughter at his own picture of an old woman.

Zeyst, or **Zeist**, a village in Utrecht, Holland, not far from the Utrecht-Arnheim railway, has a Dutch Reformed, Roman Catholic, Separatist, and Herrnhuter church. It manufactures porcelain, wax-candles, soap, and turned wares. Pop. (1876) 5626. In the neighbourhood of Z. an obelisk commemorates the Union of the Seven Provinces of the Netherlands, effected here in 1579.

Zib'eth (*Viverra Zibethia*), a species of *Viverridæ* or Civets (q. v.) found in E. Asia, and attaining a length of from 3 to 4 feet. The colour is a brown mixed with white, and marked with spots and blotches of darker hue. The Z. has a musk-secreting pouch resembling that of its African neighbour the true civet (*Viverra civetta*).

Zier'ikzee, a town of the Netherlands, province of Zeeland, and the chief town of the island of Schouwen, 3 miles from the Ooster Schelde (with which it is connected by two canal-harbours), and 21 miles E.N.E. of Flushing. Z. has six churches, a fine town-house, and a gymnasium, manufactures madder, carries on brewing and oyster-fishing, and has considerable trade and shipping. It is the oldest town of Zeeland, and was formerly an important Hanse town. Its demolished walls are now replaced by promenades. Pop. (1876) 7617.

Zie'then, or **Zie'ten, Hans Joachim von**, one of the bravest and most popular generals of Friedrich the Great, was born at Wustrau, May 18, 1699, entered the Prussian service in 1714, retired in 1724, but re-entered it as a lieutenant in 1726. A quarrel with his captain next brought him a year's imprisonment and his dismissal from the service. Restored to his rank in 1730, he became captain in 1731, and major in 1736. In 1741 he became colonel of a regiment of hussars, and in this capacity did much to increase the efficiency of the Prussian light cavalry. At the outbreak of the Second Silesian War (1744), at the head of the advanced guard he entered Bohemia, advanced to Budweis, then achieved a dexterous retreat behind the Elbe, inflicting a signal defeat on a force of 16,000 men at Moldau-Tein, 12th October. In 1745, at Jägerndorf, he led his regiment, which wore a uniform similar to that of an Austrian regiment of hussars, through an Austrian force of 20,000, in order to carry to the Markgraf Karl the orders of the king, and took an active part in the battles of Hohenfriedberg (June 4th) and Hennersdorf (November 23), soon afterwards being made major-general. During the peace he fell under the displeasure of the king, but was forgiven at the outbreak of the Seven Years' War, and appointed a lieutenant-general. He took part in the battles at Reichenberg and Prague, commanded the left wing at Kollin, next remained near the Prince von Bevern, who wished to cover Lausitz and Schlesien, and on his defeat and capture, led the remnant of his army to join the king at Liegnitz. In the battle of Liegnitz (August 15, 1760) he held back the Austrian main army during the struggle before the camp, for which on the field of battle he was made general of cavalry. At Torgau he carried the Siptitz Heights, and thus decided the victory. In the spring of 1761 Z. watched the Russians, who, however, declined to give him battle. From this time until the close of the war he remained with the king, holding during his absence the supreme command. After the war he lived chiefly at Berlin, enjoying the especial favour of Friedrich, who was a frequent visitor of his 'old father Z.' He died at Berlin, January 26, 1786. A monument was erected to him at Berlin in 1794 by Friedrich Wilhelm II. His life has been written by Luise Joh. Leopold von Blumenthal (3d ed. Berl. 1806), and Hahn (5th ed. Berl. 1878).

Zill'eh, a town in the sandjak of Sivas, Asiatic Turkey, 34 miles S.S.W. of Tokat. It stands on a height, and a large mound rises in the centre of the town, crowned with a fort. Z. has some weaving; and at its great fair in November, lasting from a fortnight to three weeks, a large amount of business is done. Pop. 10,000. The ancient *Zela*, Z. has few traces of antiquity. Mithridates defeated the Romans, and Cæsar 'came, saw, and conquered' Pharnaces at Z.

Zill'erthal, one of the chief valleys of the Tyrol, is watered by the Ziller, an affluent of the Inn. It is about 50 miles in length, and is bounded in the S. and W. by great glaciers, but in the N., where it opens out into the valley of the Inn, it is tolerably fertile. Cattle-rearing is the chief occupation of the inhabitants, who number about 15,000. Many of these, however, wander over Europe for summer service. The chief town is Zell. See Streiter, *Bläter aus Tirol* (1868); and Löwe, *Aus dem Zillerthaler Hochgebirge* (Gera 1878). In 1830 a remarkable secession from the Roman Catholic Church began to take place here, and went on for some years. The difficulties of their new religious position compelled the seceders (400 in number) to emigrate in 1837. They found a refuge in Prussia, and settled at Erdmannsdorf, where they were assisted by a grant from the Prussian Government. In 1878 they numbered 225, but a large number had established themselves in other parts of Germany. See Beheim-Schwarzbach, *Die Zillerthaler in Schlesien* (Bres. 1875).

Zimb, the name given to a species of *Diptera* or Flies, allied to the *Tsetse* (q. v.), and believed to be the *Zebub* mentioned in Isaiah vii. 18. It occurs in Abyssinia, where it is exceedingly destructive to cattle. The elephant, rhinoceros, and camel also suffer from its attack. The average size is that of a bee. The Z. infests marshy soils.

Zimm'erman, Johann Georg von, a Swiss physician and philosopher, was born at Brugg, in the canton of Aargau, 8th December 1728, went in 1747 to the University of Göttingen, where he studied medicine under the immediate supervision of his distinguished countryman, Haller, and graduated with distinction in 1751, when he published a remarkable *Dissertatio Physiologica de Irritabilitate*. After travelling in France and the Low Countries he settled as a physician in Bern, marrying a young widow, a kinswoman of Haller. Shortly afterwards he received the appointment of town physician in his native place, Brugg, where he remained for sixteen years, gaining wide professional repute, and at the same time cultivating assiduously the literary and philosophical studies to which his tastes attracted him. He published a *Life* of Haller (Zür. 1755), and *Betrachtungen über die Einsamkeit* (Zür. 1756), a work which contained the germs of the later treatise with which his name is inseparably connected; *Vom Nationalstolze* (Zür. 1758), and his most noted medical work, *Von der Erfahrung in der Arzeneikunst* (Zür. 1763-67), which was translated into many foreign languages. Many offers were made to tempt him away from the comparative retirement in which he lived at Brugg, and in 1768 he accepted the post of court physician at Hanover with the title of Hofrath. Two years later he lost his wife, and in 1781 he was forced to go to Berlin to submit to a painful operation, which was successfully performed, but afforded only temporary relief from the illness which had made it necessary. Further family misfortunes—the death of his daughter and his son's loss of reason—now conspired to aggravate the constitutional melancholy to which he had always been a prey. He was in danger of sinking into a state of hopeless despondency, but was saved for the time by a second marriage, which had an excellent effect upon him. He now published his famous work *Ueber Die Einsamkeit* (4 vols. Leip. 1784-85), which redoubled his already considerable fame, and procured for him an invitation from the Empress Catharine to settle at the court of Russia, which, however, he did not accept. On his visit to Berlin in 1781 he had been warmly received by Friedrich II., who in his last illness in 1786 desired to have the advice of Z. He accordingly went a second time to Berlin, but found the king's case hopeless. The literary results of this visit were two works entitled *Ueber Friedrich den Grossen und meine Unterredung mit ihm kurz vor seinem Tode* (Leip. 1788), and *Fragmente ueber Friedrich den Grossen* (Leip. 1790). His alleged indiscretions in these works involved him in controversies which contributed to the embitterment of his latter years. His melancholia gradually increased, he became a prey to painful delusions, and died at Hanover, 17th October 1795. See *Z.'s Eigene Lebensbeschreibung* (Han. 1791); Marcard's *Beitrag zur Biographie des J. G.*

ven Z. (Hamb. 1796); Tissot's *Vie de Z.* (Lausanne 1797), and Bodemann's *J. G. Z.* (Han. 1878).

Zinc is a metal which has been known in a separate state only since the days of Paracelsus, although it has been used with copper in the alloy brass from very remote times. It did not come into any considerable prominence till about the middle of the 17th c., at which time the smelting of the ores was begun in various parts of Europe. At the present day the principal centres of Z.-smelting are Silesia, Belgium, England, and the United States of America. The most important ore of Z. is calamine, a carbonate of Z., $ZnCO_3$, a widely disseminated mineral obtained in Silesia, Belgium, the north of Spain, the Mendip Hills in Somersetshire, and many other localities. A silicate of Z., $ZnSiO_4H_2O$, known as siliceous calamine or Z. glance, is also an ore of some importance, very commonly associated with ordinary calamine. From the red oxide of Z. or spartalite, ZnO, which owes its colour to the presence of iron and manganese, a large amount of Z. is obtained in America. Z.-blende, the sulphide of Z., ZnS, is also an ore which is smelted largely. Z., or, as it is commercially called, spelter, is a bluish-white metal having an atomic weight of 65·0; its specific gravity ranges from 6·8 to 7·2; it melts at 773° F. and boils at 1904°, or, according to Becqueral, at 1636°. It volatilises at a red heat, and the vapour, if exposed to the air, burns with great brilliancy, emitting a luminous flame, at the same time forming zincic oxide which deposits in copious flocculent masses. Z. is a very brittle metal, but when heated to from 212° to 302° F. it becomes sufficiently malleable and ductile to allow of being rolled into thin sheets and otherwise worked. When exposed to moist air, Z. quickly becomes coated with a thin film of oxide which closely adheres to the surface and prevents the oxydising influence penetrating further into the metal. It is readily attacked by dilute mineral acids, a common means of preparing hydrogen being to place granulated Z. in a dilute solution of sulphuric acid.

In the extraction of Z. from its ores distinct processes are employed in different countries, the principal being the English, the Silesian, and the Belgian or Vieille Montagne process. In all cases the ore is first crushed between rollers, separated from impurities, and roasted on the sole of a reverberatory furnace. In this way zincic oxide is produced from any of the compounds, and the roasted mass is mixed with its own weight of anthracitic coal ground fine, after which it is ready for treatment by any of the plans above indicated. According to the English process the mixture is placed in closed crucibles within a low-arched furnace somewhat like a glass furnace in construction. In the bottom of each crucible is an opening to which is attached a short iron tube. A longer tube of larger bore fits to the end of the first tube, and beneath the open end of the second tube is an open iron vessel into which the Z. is received. The reduction is effected by a process of distillation, carbonic oxide coming off first, which burns with a blue flame at the end of the short iron tube. After a few hours the flame assumes a brown tint owing to the distillation of cadmium which is always mixed with the ores, and which being more volatile distils over before the Z. When the characteristic flame, a bluish white, of Z. appears, the long tube is attached and thereby the flame is extinguished. The metal then distils, partly as powder and partly in drops, and is received in the iron vessel into which the tube dips. It is thereafter re-melted, skimmed, and cast into ingots of spelter, or rolled into sheets. In the Silesian process the distillation is effected in closed retorts of peculiar form, having in one end apertures for charging and withdrawing the exhausted charge, and a bent tube for carrying off the distillate. These are arranged in two horizontal rows on the same plane, end to end, in a furnace or oven like a gas-retort bench, and they are now generally fired by the Siemens Gas Regenerative system. In the works of the great Vieille Montagne Company and others in Belgium, long cylindrical retorts are used which are placed in several tiers above each other in a high furnace. The retorts have an open end projecting out of the furnace, the inner end rests in niches in the back wall, and they have a gentle slope down to the mouth end, on which is luted a wide, conical cast-iron pipe which acts as a receiver for the distilled metal. At the open extremity of the receiver a sheet-iron tube is fitted by which the gaseous products are carried off. As many as forty or forty-five retorts are arranged in the same furnace, those in the higher tiers being charged with the poorer ores, for the reduction of which a less intense heat is needed than for the richer ones.

The uses of Z. are varied and important. It is very extensively consumed in the form of amalgamated plates in the construction of voltaic batteries. These plates are prepared by thoroughly cleaning the surface of Z. plates and dipping them into a strong solution of mercuric nitrate or chloride, or by simply rubbing over the plates, wet with dilute sulphuric acid, with metallic mercury. It is also largely used in preparing Galvanised Iron (q. v.), which consists of sheet or wire iron coated with Z., by dipping or passing the iron previously rendered chemically clean through a bath of molten Z., the surface of which is protected by a covering of sal ammoniac. In some cases a thin film of tin is first deposited on the iron surface by voltaic action before galvanising, and sometimes a little tin is added to the Z. bath. The metal also forms a series of valuable alloys, the most important of which are Brass (q. v.) and German silver. In 1877 the 57 mines of the United Kingdom yielded 24,405 tons of ore; in 1876 the yield of the German Empire was 533,559 tons of ore (449,374 from Silesia), and of the Austrian 13,226. The quantity of Z. smelted throughout the world during 1877 was estimated to amount to 178,690 metric tons, of which 49,377 were smelted in Silesia, 38,518 by the Vieille Montagne Company of Belgium alone, 6833 in the United Kingdom of Great Britain and Ireland, and 15,000 tons in the United States of America.

Medicinal Properties of Zinc.—Z. in its purely metallic state produces no medicinal effect upon the animal economy, but several of its compounds possess active medicinal properties. Granulated Z., which is used in the preparation of *liquor* Z. *chloridi*, Z. *chloridum*, and Z. *sulphas*, is prepared by fusing the Z. of commerce in an earthern crucible, heated to a sufficient degree to melt the Z., but not to produce combustion, which is then poured in a very thin stream into a bucket of cold water and afterwards dried. The following pharmaceutical preparations of Z. are contained in the British Pharmacopœia, viz., the *acetate*, the *carbonate*, the *chloride*, the *oxide*, the *sulphate*, and the *valerianate* of Z. *Acetate* of Z. is prepared by the action of acetic acid upon the commercial oxide of Z., and is obtained in thin, translucent, and colourless crystalline plates, of pearly lustre, which effloresce in a dry atmosphere, and are very soluble in water. The taste is astringent and metallic, and its properties are similar to those of the sulphate of Z., but it is probably somewhat less active. *Acetate* of Z. is used chiefly as an astringent collyrium in ophthalmia, in the proportion of one to two grains to a fluid ounce of water; or as an injection in gonorrhœa, after the acute stage has passed, in from 5 to 20 grains to the fluid ounce. *Carbonate* of Z. is made by precipitating the sulphate of Z. by the carbonate of soda, and is obtained as a white powder, closely resembling in its properties the oxide of Z. It is used in medicine as a cerate in the proportion of 1 to 5, and is prescribed, internally, in doses of from 2 to 10 grains. *Impure carbonate* of Z., or calamine, is used for making lotions, and for Turner's cerate. *Chloride* of Z. is prepared by the action of muriatic acid upon Z., and occurs in colourless, opaque rods or tablets, very deliquescent and caustic, and soluble in both water and alcohol. *Chloride* of Z. is sometimes prescribed internally in doses of from ½ to 1 or 2 grains, as an alterative and tonic, but it is chiefly used externally as a caustic and disinfectant. When applied in a concentrated form it causes intense pain, lasting from six to eight hours, and a whitish eschar is formed which usually separates in from six to twelve days, the slough being free from odour, but it is usually applied in the form of a paste. *Canquoin's Paste* is made by mixing the chloride of Z. with flour and water in the proportion of from one to three or one to six. When used, ten to fifteen drops of water are added to the paste, which is applied in layers, successive applications being required when a large tumour is to be destroyed. *Liquor Z. chloridi* is used as a disinfectant, and is commonly known as *Sir W. Burnett's Disinfecting Solution.* In cases of poisoning by chloride of Z., carbonate of soda should be freely given. When oxide of Z. is mixed with an equal weight of *chloride* of Z., the latter may be preserved dry enough to blow through a tube into any cavity required, as the cavity of a tooth after the removal of the diseased parts. *Chloride of Z. points* are also prepared by mixing one part each of *chloride* of Z. and *oxide* of Z. with two parts of wheat flour and a sufficiency of water to make a stiff paste, which is then moulded into points. *Oxide* of Z. is made by

heating the *carbonate* of Z. until the water and acid are driven off, when it appears as a soft, white, tasteless, and inodorous powder, insoluble in water, but soluble in dilute acids. *Oxide* of Z. is used internally in convulsive affections, especially in epilepsy and chorea, in doses of from 2 to 10 grains; but its chief use is as an astringent and absorbent in the form of powder or ointment to slight excoriations and ulcerations, and in cases of chronic eczema. When applied to the feet it destroys the unpleasant odour of perspiration. *Sulphate* of Z. occurs in minute, transparent, prismatic crystals which effloresce slightly in dry air and are soluble in water, but insoluble in alcohol. *Sulphate* of Z., in small doses, acts as a tonic and astringent; and, in a concentrated form, as an active irritant. In doses of 30 grains it acts as an efficient emetic; and in 2-grain doses it may be given as a stimulant astringent in chronic diarrhœa with ulceration. When taken in poisonous doses, alkalies and their carbonates should be given, and also eggs and milk. *Sulphate* of Z. is chiefly used, externally, as an astringent injection in fluor albus, the advanced stages of gonorrhœa, or as a wash for indolent ulcers, or a collyrium in ophthalmia. It is also used as a styptic. Sticks of fused *sulphate* of Z. are applied as an astringent to suppurating surfaces. *Valerianate* of Z. occurs in bright white tabular crystals with a feeble odour of valerianic acid and a metallic taste. It is prescribed in doses of from 1 to 6 grains as an antispasmodic in chorea, epilepsy, and in various neuralgic and hysterical affections.

Zincog'raphy is an art analogous to lithography, the stone printing-surface of the latter being replaced by a zinc plate. A novel method of printing facsimiles of rare prints, books, &c., from plates of polished zinc was invented in 1841 by Baldernus of Berlin, and introduced into England four years later by C. W. Siemens. It is called *Anastatic printing* (Gr. *anastasis*, 'a raising up'). A paper to be copied is wetted with dilute nitric acid, and brought into intimate contact with a plate of polished zinc. The portions of the zinc plate in contact with the unprinted parts of the paper are etched by the acid, and a reversed copy of the printing is thus 'set off,' and presents a slight relief on the plate. The plate is then washed with a solution of gum in weak phosphoric acid which readily wets the 'bitten' portions, but is repelled by the grease of the printing. A lithographic inking-roller is then brought over the zinc plate, the ink being taken up by the greasy printed parts only, and an impression is obtained in the ordinary lithographic press. *Paneiconography* (Gr. *pan*, 'all,' *eikōn*, 'an image,' and *graphō*, 'I write'), invented by Gillot, of Paris, is a process of producing a design in relief on a zinc plate adapted for printing in a typographical press. The design is either executed in lithographic crayon or ink by the artist, or a fresh impression of a lithograph, woodcut, or copperplate engraving is transferred to the zinc plate. The design is again inked, and powdered rosin dusted over it. The zinc plate is then submitted to the action of dilute hydrochloric or sulphuric acid, which eats away and lowers the portions of the plate unprotected by rosin. The operations of inking, dusting with rosin, and etching are repeated till sufficient relief of the design is obtained.

Zin'gel (*Aspro zingel*), a species of *Teleostean* fish allied to the Perch (q. v.), and found in the Danube and some other European rivers. The body is long, and the mouth is placed under the snout There are two discontinuous dorsal fins, and the others are large. The average length of the fish is 12 inches. Another species (*A. vulgaris*) inhabits the Rhone. Both kinds are very palatable.

Zingibera'ceæ, an order of monocotyledons, considered by some as a sub-order of Scitamineæ, and distinguished from both Musaceæ and Marantaceæ by the stamens (of which one only is perfect) bearing a two-celled anther. The species are exclusively tropical, aromatic, with creeping root-stock, large simple handsome flowers, forming either a dense spike or a branched panicle. Zingiber, Curcuma, Amomum, Alpinia, and Costus are among the more noted of the thirty or forty genera of Z.

Zinz'endorf und Pott'endorf, Nikolaus Ludwig Graf von, a name eminent in the religious history of Germany, was born at Dresden, 26th May 1700. He studied law and theology at Wittenberg (1716), resided abroad for some years (1719–20), gave himself up to evangelical labours, and founded on his estate of Berthelsdorf a religious community, chiefly consisting of men who had been driven out of Bohemia and Moravia on account of their religious opinions (1723). This community was called Herrnhut ('protected of God'), and it soon attracted great attention in Germany from the zeal of its members, the high position of Z., and the constant intermeddling of church and state with its affairs. Z. qualified himself for the pastoral office, and in 1737, at Berlin, was consecrated as bishop with the sanction of the government. This, however, seems to have roused his enemies to fresh efforts, for shortly after the government condemned him to perpetual banishment as a religious innovator, and Z. was obliged to leave Saxony. In 1747 he was permitted to return and resume his labours. He died 9th May 1760, at Herrnhut. Z. held the usual 'orthodox' Protestant views with but little modification, but he held them with the fullest concession of the right of free opinion to others. He was an earnest, sincere, and noble man. His writings, among which were several collections of 'hymns,' were entirely of a religious character. See the Lives of Z. by Spangenberg (8 vols. Barby 1772-75), Bovet (3d ed. Par. 1865; trans. by Gill, Lond. 1865), and Burkhardt (Gotha 1866); Korner, *Die Kursachsische Staatsregierung dem Grafen Z. und Herrnhut bis* 1760 *gegenuber* (Leip. 1878); and Plitt, *Pottendorfs Theologie* (3 vols. Gotha 1869–74).

Zi'on. See JERUSALEM.

Ziph'ius, a genus of Whales (q. v.) belonging to the family of the *Rhynchoceti*, or 'Beaked whales. Z. occurs in the Mediterranean Sea and S. Atlantic. The snout is pointed, there is a single blow-hole, and a small dorsal fin is developed. There are no teeth in the upper jaw, but the lower jaw is provided with from 1 to 2 pairs. *Z. Sowerbiensis* is a familiar species. The average length is 16 feet.

Zirco'nia Light, an intensely brilliant light differing from the Drummond Light (q. v.) mainly in the employment of cones of the oxide of zirconium instead of the less durable cylinders of lime. In 1867 Tessié du Motay introduced the Z. L. into Paris, and it was there employed for several years to illuminate squares and public buildings and gardens. The cones were formed of burnt zirconia kneaded into a paste with aqueous boracic acid, and hardened in iron moulds at a red heat, and a mixture of oxygen and a highly carburetted gas was burnt to raise the cones to incandescence. The Z. L. was also some time used as an illuminant in public places of Brussels and Vienna, and in America in lighthouses and public works. The construction of the Brooklyn Bridge over East River, New York, was conducted by night under the radiant light from zircon cones acted on by oxygen. The Z. L. has been practically superseded by the Electric Light (q. v.)

Zirco'nium (Zr=89·6), a somewhat rare metal, intermediate in many of its properties to aluminium and silicium. Its oxide, zirconia, was first prepared by Klaproth in 1789 from the mineral zircon, which is essentially a silicate of Z., and is found crystallised in square prismatic or octahedric crystals. Eudialyte, wöherite, fergusonite, and a few other rare minerals also contain small quantities of Z. Like silicum, this metal exists in three allotropic conditions, amorphous, crystalline, and graphitoidal. It burns in air only at the temperature of the oxyhydrogen flame, but ignites in chlorine gas at a red heat. It is affected slightly by ordinary acids, though readily attached by hydrofluoric acid evolving hydrogen. Zirconia (ZrO_2) is prepared by fusing zircon with four times its mass of dry sodium carbonate with a little sodium hydrate, treating with hydrochloric acid to dissolve out the silica, and precipitating the impure zirconia by the addition of ammonia. When purified it forms a white powder, or hard lumps of specific gravity 4·35 to 4·9. It forms two hydrates, having the compositions ZrO_3H_2 and $ZrO_2 \cdot 2H_2O$. Zirconia acts both as a base and an acid, but after ignition is acted upon only by hydrofluoric or strong sulphuric acid. The fluoride (ZrF_4) unites with other metallic fluorides forming zircofluorides which are isomorphous with the corresponding silicofluorides, stannofluorides, and titanofluorides.

Zirk'nitz, a lake of Austria, 30 miles E.N.E. of Trieste, is 5 miles long, 3 broad, and 60 feet deep. It is chiefly remarkable for the fact that at irregular intervals its waters wholly disappear through fissures in its limestone bed which communi-

cate with cavernous reservoirs below. There are four islands in the lake—one peopled—and numerous villages on the shore. The usual time of disappearance is August; the return of the water occurs suddenly, and usually in September. Sometimes the lake remains undrained for five or six years. Once, in 1834-35, it was dry for fourteen months continuously.

Zis'ka (pron. *Shishka*) **of Trocnow, John,** the Hussite leader, was born of noble parents about 1360 at Trocnow, in the Budweis district of Bohemia. Though he had lost his left eye when a boy, he spent his youth as a page at the court of King Wenceslaus, in 1410 joined the troops that marched from Bohemia and Hungary to help the Teutonic knights against the Poles and Lithuanians, and took part in the battle of Tannenberg (15th July). After this he fought in the campaigns of the Hungarians against the Turks, and on the side of the English against the French, especially distinguishing himself at Agincourt (1415). On his return to Bohemia, he attached himself to the extreme party of the Hussites, who under his leadership quickly became trained soldiers, and learned to fortify their camps by 'Wagenburgen,' *i.e.*, waggons so placed as to form defensive squares. In 1421 he founded a fortress on Mount Tabor, on the 14th July of that year he defeated the German crusading army on the mountain ever since called *Ziskaberg*, and in January 1422 he decisively defeated Siegmund in the battle of Böhmisch-Brod. At the head of the Taborites, Z. now advanced against the moderate Calixtines, whose possessions he ravaged in the most wanton manner. Though at the siege of the Castle of Raby in 1421 he had lost his second eye, he still continued not only to order the march, following his officers' descriptions of the ground, but to direct in battle his 'invincible legion of brothers.' The Emperor had already begun to despair of success in the contest, and had opened negotiations with Z., promising full liberty of conscience, when the latter died, during the siege of Przibislaw, October 11, 1424. He was buried in the Church of SS. Peter and Paul at Czaslau, with his battle-axe suspended above his grave. In 1623 the tomb was opened by imperial command, and his bones were removed to Vienna. Z. was an able commander, quick in thought and action, of great presence of mind, and of iron firmness, a merciless opponent of the enemies of his country and his faith. See HUSSITES, and Millauer, *Diplomatisch-historische Aufsätze über John Z. v. T.* (Prague 1824).

Zittau' (orig. *Sittower*, 'corn town'), a town of Saxony, on the Niesse, 71 miles E.S.E. of Dresden by rail. It has a magnificent Rathhaus (1844), the Church of St. John (1836) in the Byzantine style, 6 other Protestant churches and 1 Catholic, a gymnasium, and other excellent schools, and is surrounded by fortifications. A great seat of cotton manufacture, Z. has also linen, paper, and saw mills, and some iron foundries. Coal is found in the vicinity. Pop. (1875) 20,417. A frontier town, Z. was almost destroyed by an Austrian bombardment in 1757, but has long had an active trade. For a notice of its interesting history see Peschek's *Handbuch der Geschichte von Z.* (Zitt. 1835-38).

Zlatoust' or **Slatoust'**, a town of Russia, government of Ufa, on the Ai, an affluent of the river Ufa, and near the Ural Mountains, 150 miles N.E. of Ufa. In the vicinity are rich iron and gold mines. Z. manufactures sword-blades and other steel fabrics. Pop. (*St. Petersb. Cal.* for 1878) 16,629.

Zmein'ogorsk (Russ. 'snake mountain'), a mining town of Asiatic Russia, in the government of Tomsk, with silver, copper, lead, and iron mines. Its silver-smelting furnaces turn out about 3½ tons of silver annually. Pop. (1870) 14,904.

Znaim (Czech. *Znojem*), a town of Moravia, Austria, on the Thaya, 50 miles N. by W. of Vienna by rail. It has a Rathhaus (1446), a circular church, said to have been a heathen temple, and the Gothic Church of St. Nicolas. The old ducal castle crowns a neighbouring height. The trade is largely agricultural. Mustard, wine, and cucumbers are exported, and there are large potteries, at which fine Majolica is produced. Leather and chocolate are also manufactured. New waterworks were opened in 1877. Pop. (1869) 10,415. Formerly *Znoimo*, under which name it was the capital of Moravia, Z. was destroyed in 1145 by the Bohemian prince Vladislav, but was rebuilt in 1226. On 11th July 1809 the French under Massena and Marmont defeated the Austrians here, and from 13th July to 3d September 1866 it was held by the Prussians. See Hübner's *Denkwürdigkeiten der Stadt Z.* (Znaim 1869).

Zoar, a village of Ohio, U.S., settled in 1817 by Germans, on a communistic basis. The Society of Separatists of Z. hold nearly 8000 acres, and a board of trustees manage their business. Pop. (1780) 326. See *Communistic Society of the United States*, by Charles Nordhoff (Lond. 1875).

Zoanthar'ia, an order of *Actinozoa* (q. v.) in which the sea anemones and most of the corals are contained. The tentacles and soft parts exist in multiples of 5 or 6. The Z. are divided into the *Z. malacodermata* (sea-anemones, &c.), *Z. sclerobasica* (*Antipathes*), and *Z. sclerodermata* (reef-building corals).

Zo'diac is the name given to the imaginary zone in the heavens, which extends about 8° or 9° on each side of the ecliptic. It is divided into twelve regions or *signs*, each of which is occupied by the sun during a particular month of the year, and which retain the names of the constellations with which they were originally identical. The names of these signs are Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces. The sun enters Aries at the spring equinox, and Libra at the autumnal equinox, while the first points of Cancer and Capricornus mark the summer and winter solstices respectively. In consequence of the precession of the equinoxes, the constellations corresponding in name with the signs of the Z. and originally coincident with them have moved along the ecliptic in the direction of the sun's motion, so that the *sign* Aries coincides at present with the *constellation* Pisces. Astronomically, the Z. is of no practical value; its chief interest is historical. Though the name is Greek in origin, being derived from *zōdion*, a diminutive of *zōon*, an animal, and so employed because of the preponderance of animal figures among the signs, the real origin of this division of the sun's apparent path in the heavens dates from a much earlier period than that in which the Greek school of astronomy flourished. On the ceilings of portions of the ancient temples of Denderah and Esne in Egypt, symbolic representation of the signs is still to be seen; and evidence exists to show that among the Persians, Hindus, Chinese, and Japanese a similar division of the Z. has long been used. More recently Rawlinson has found in the lately discovered library of Sardanapalus at Nineveh interesting notices concerning the Z., including an epic poem upon the twelve month-adventures of Izduhar, the hero of the sun, which is simply a poetical account of the zodiacal signs. The general similarity of the Z. as existing in the different nations of antiquity points to the strong probability that these have derived their knowledge from one original source, and that present discrepancies are the result of subsequent departures from the first Z. forms.

Zodi'acal Light, a cone-shaped luminosity which appears at certain times of the year either after sunset in the west or before sunrise in the east. The axis of the cone lies in the sun's equatorial plane, so that the phenomenon appears confined within the limits of the zodiac, hence the name. At the vernal equinox, the Z. L. appears as a pyramidal body of light, broad and bright at its horizon base, but fading gradually as it tapers up towards the Pleiades. In the tropics its brilliancy is very marked, rivalling at times the Milky Way; but in temperate latitudes it is to be seen only on favourable evenings. Of late years the Z. L. has been seen to best advantage not at the equinoxes but at a somewhat later date, a fact which suggests a precessional motion, if, as is most probable, the Z. L. be a solar appendage. The first recorded observation of the phenomenon is by Childrey in 1660; but Dominico Cassini (1683) was the first to make careful measurement of its dimensions. He suggested that it might be due to the blended light of innumerable minute planets circulating round the sun; Euler speculated upon the probability of its identity with comets; Mairan and others regarded it as the solar atmosphere, a hypothesis which Laplace proved to be untenable; Schubert, Laplace, and Poisson believed it to be a nebular ring revolving planet-fashion round the sun; Sir John Herschel conjectured that it was simply a denser region of the interplanetary medium, 'loaded perhaps with the actual material of the tails' of comets; later speculators have striven to establish a terrestrial origin; but, perhaps, the most plausible of all hypotheses is that supported

by Sir W. Thomson, which regards the Z. L. as the glow from a cloud of meteors circulating round the sun. Taken in conjunction with the established laws of meteor streams and Tait's 'sea-bird' theory of Comets (q. v.), this hypothesis not only can be made to account for all the peculiarities of the Z. L., but is remarkable as combining in one the early theories of Cassini and Euler.

Zo'ilus, a Greek rhetor, said to have been a native of Amphipolis in Thrace, flourished in the 3d or 4th c. B.C. The scanty notices of him in scholiasts and others do not always agree, and as nothing he wrote has survived, we can form no secure opinion of his real character as a critic. Antiquity, however, seems to have been unanimous as to his bitter hostility to Homer, on account of which he was called *Homeromastix* ('the scourge of Homer'). His name has in consequence become a symbol for any rancorous critic. 'Every great poet has his Z.'

Zo'la, Émile, born in Paris, 2d April 1840, is the son of an Italian engineer. Bred in Provence and educated at the Parisian Lycée Saint-Louis, he turned from bookseller a novelist, producing *Contes à Ninon* (1864), *La Confession de Claude* (1865), *Le Voeu d'une Morte* (1866), *Les Mystères de Marseille* (1867), &c., titles that indicate the scope of one who may fairly be called a realist of the foulest water. An immense success has attended his series, *Les Rougon-Macquart, histoire naturelle et sociale d'une famille sous le second Empire* (7 vols. 1874–77), the last volume of which, *L'Assommoir*, was dramatised by Charles Reade under the title *Drink* (1879). Z. himself brought out two comedies, *Club* and *Le Bouton de Rose*, in 1878, with small success; his latest work is *La République et la Littérature* (1879).

Zoll'verein (Ger. 'customs-union') was a union for certain fiscal purposes of the smaller German States under the leadership of Prussia. The need for such a union was long felt, for it is easy to imagine how utterly ruinous to commerce it must have been to be obliged to cross a frontier every few miles. The purpose of the Z. was to enable all the contracting states to act for certain purposes as one. All imports were collected on a common frontier, and the funds thus received were divided among the states in proportion to their several populations. The necessity of a Z. was acknowledged at the reconstruction of Germany after the final fall of Napoleon. Prussia so quickly growing into dominion, took the lead in a series of commercial measures (20th May 1818), and by a succession of treaties and agreements, renewed from time to time, by far the greater proportion of the German states became incorporated in the union. The affairs were managed by a *Zollbundesrath*, or council of delegates from the covenanting states, and a *Zollparliament*, or assemblage of those chosen by popular election. These were of course done away with when the modern German Empire was founded. By the 33d article of the Constitution (16th April 1871), the whole of Germany, except Bremen and Hamburg, is included in one common system of duties. The Z. was a step, though a very humble one, towards the great end of German unity. See Weber, *Der Deutsche Z., Geschichte seiner Entstehung und Entwickelung* (2d ed. Leip. 1871).

Zom'bor (Sombor), a town of the Hungarian comitat, Bács-Bodrog, on the Baczer or Franzens Canal, which unites the Theiss with the Danube, and 65 miles S.W. of Szegedin by rail. It has two Greek churches, a magnificent town-house, and a public library, and carries on manufactures of silk. There is a large trade in cattle and corn. Pop. (1869) 24,309.

Zona'ras, Joannes, a Byzantine writer of the 12th c. A.D., born at Constantinople, held various high offices at the courts of Alexius and Joannes Comnenus, but afterwards withdrew to a monastery on Mount Athos, where he died at the age of eighty-eight. His *Chronicon*, from the creation to 1118 A.D., is valuable as preserving many fragments of perished histories, and was last edited by Dindorf (6 vols. Leip. 1868–75), and his Commentaries were edited by Beveridge (Oxf. 1672). He was also the reputed author of several other works, among them a Greek Lexicon (ed. by Tittman, 2 vols. Leip. 1808.

Zonu'ridæ, a family of *Lacertilia* (q. v.) or Lizards, in which the limbs may be well developed or altogether wanting. There is a longitudinal fold of skin on the sides of the body, and the scales of the abdomen are square or rounded in form, and are disposed in zones or bands—hence the origin of the name Z. Distinct ears and eyelids are developed. The *Ophisaurus* or Glass Snake of America, and the *Pseudopi* or *Sheltopusiks* of the Old World, represent the family.

Zo'öids (Gr.), the name given to the beings produced by asexual processes of *gemmation*, or budding, or by *fission*. The Z. collectively make up a compound 'individual'—as for example in a Zoophyte (q. v.), where the whole organism, including its hundreds of animals, is an 'individual' animal, its constituent elements being named '*zoöids*.'

Zool'ogy (Gr. *zōon*, an 'animal,' and *logia*, a 'discourse' or 'scientific account'), the department of *Biology* (q. v.) which deals with the structure, physiology, and distribution of the animal world. Under this head also the details of *Comparative Anatomy* are investigated. The following divisions enter into the principles of zoological study :—

I. *Morphology.* (Science of Form)	(*a*) Anatomy. (*b*) Development. (*c*) Taxonomy.
II. *Physiology.* (Science of Function.)	(*a*) Function of Nutrition. (*b*) Function of Reproduction. (*c*) Function of Correlation or Irritability.
III. *Distribution.*	(*a*) In Space (Geographical). (*b*) In Time (Geological).

We find, firstly, a science which deals with the form and structure of the organism, and this we term Morphology. Secondly, we have the science of function—Physiology. And lastly, we have the Distributional aspect of the science, by which we ascertain the habitat of an animal, or the conditions in which it exists with regard to the external world. It is further to be observed, that each of these primary sections is divided into subsidiary branches. Thus under the head of Morphology, we have *Anatomy, Development*, and *Taxonomy*, each subdivision dealing with a separate aspect of the main science; and we shall now endeavour to explain the object of each section. We may, firstly, study an animal morphologically; that is, consider its form and structure. Under this head we observe its various structural features. By *Anatomy* we investigate its external and internal appearances, the positions and relations of organs and parts. We thus obtain a knowledge of its structure as a fully-formed being. But if we wish to study it through the various stages leading from the embryonic to the mature and adult state, we must call to aid the second department of morphological science, and consider the subject of *Development*. From these, we pass by an easy transition to the consideration of its place in the scale of life, and for which task our knowledge of its structure has fully prepared us. We thus include the third division, that of *Taxonomy* or *Classification*. Having investigated the structural relations of the animal, we next proceed to inquire into its *Physiology* or the study of its *Functions*. Of these, the first is the function of *nutrition*, through which the animal nourishes itself; secondly, we find the function of *reproduction*, through which the *species or race* is maintained; and thirdly, the function of *innervation*, or that of the nervous system, through which the animal maintains relations with the external world. The third and last division of biology is that of *Distribution*. By this branch we determine the place an animal occupies in the globe at the present time, or the conditions under which it existed in times past. The former aspect deals with the *geographical* distribution of the organism; the latter investigates its *geological* relations. Thus the Marsupial or Pouched Mammals, represented by the kangaroos and their allies, occupy a very limited geographical area, being almost entirely confined to Australia, whilst their geological relations present many features of similar import and interest. In this way the modern study of Z. is prosecuted, some authorities adding a fourth head, that of *Etiology*, to the three preceding sections. Through *Etiology*, the *descent* and *origin* of animals are investigated, this department dealing with the evolutionary aspects of zoological science. The modern arrangement of the animal world is based on the discovery of *morphological types*, or *sub-kingdoms* of animals, which are usually ranked as follows :—(1) *Protozoa* (q. v.), (2) *Cælenterata* (see HYDROZOA), (3) *Echinozoa* or *Annuloida* (q. v.), (4) *Annulosa* or *Articulata* (q.v.), (5) *Mollusca* (q. v.), and (6) *Vertebrata* (q. v.).

Zo'ophyte (Gr. *zōon*, an 'animal,' and *phyton*, a 'plant'), the name used generally, in zoology, to denote those compound colonies of animals which grow in the striking likeness of plants,

but limited in scientific strictness to the plant-like members of the class *Hydrozoa* (*Cœlenterata*). The *Sertularians* or sea-firs and the *Flustræ* or sea-mats, included in the class *Polyzoa* (q.v.) of the Mollusca, are good examples of the Z. The Z. consists of a colony of animals, produced by a process of *continuous gemmation* or *budding*, but it can also propagate its species by means of *ova* or eggs. The ova lay the foundations of new colonies.

Zo'ospore (Gr. *zōos*, 'living,' and *spora*, 'a seed'), or **Swarmspores**, are bodies found in cellular cryptogams endowed with a remarkable spontaneous power of motion. They occur, for instance, in fresh water and marine *Algæ*. After breaking free as microscopic particles of protoplasm from the particular cell of the parent plant in which they have been formed, they swim about like Infusoria by means of vibratile cilia for a longer or a shorter time, gradually settling to rest, when a cell-wall of cellulose is developed, and they grow into new individual plants. It was by the observation of this reproduction that Z. were finally removed from the animal kingdom.

Zoot'oca (Gr. *zōotokos*, 'producing young alive'), a genus of lizards included in the family *Lacertidæ*, and represented by the *Z. vivipara*, the Viviparous or Scaly lizard, which, with the *Lacerta agilis* or Sand lizard, are the only members of the Lizard group inhabiting Britain. The viviparous lizard is common on heaths and in grassy places. It attains a length of 6 inches; the colour is olive-brown above, with a dark line passing along the spine. The under parts are orange, marked with black in the male, and olive-brown in the female.

Zoroas'ter (more properly **Zarath'ustra**, in modern Persian **Zerdusht'**), the founder of the religious system contained in the Zend-Avesta (q. v.), now professed only by the Parsees or fire-worshippers of Western India. The derivation of the name is uncertain; but it probably means 'elder' or 'priest,' and as such is identified with the author of the sacred books or Zend-Avesta, which have evidently been composed at different periods. That Z. was an historical personage, equally with Buddha, Confucius, and Mahomet, it is impossible to doubt; but the traditional accounts of his life are absolutely untrustworthy. We only know that his family name was Spitami, and that he was born in Bactria, near the modern Balkh. The best authorities place him in the 10th c. B.C. In all likelihood, it was under his reforming influence that his Iranian countrymen were induced to separate from the common Aryan stock, taking with them a religion that still shows traces of the nature-worship of the Vedas, and a language that is most nearly akin to the primitive Sanskrit. This religion, contrary to vulgar opinion, does not possess as essential characteristics either dualism between the powers of good and evil, or fire-worship, or the study of astronomy. It may be more truly described as pure monotheism, expressed in elaborate rules of ceremonial observance. Fire-worship is probably a relic of the natural mythology of the primitive Aryan faith, and dualism is a philosophical conception of comparatively recent growth. So far as we are able to distinguish the original matter from later accretions, the sum total of Z.'s teaching is the belief in Ahura Mazdao, Auramazda or Ormuzd (q. v.), 'the source of light,' as opposed to the many *devas* or gods of the Sanskrit-speaking Hindus. See *Essays on the Sacred Language, Writings, and Religion of the Parsees*, by Martin Haug (Bomb. 1862); Spiegel, *Erânische Alterthumskunde* (3 vols. Leip. 1871–78); and Darmesteter, *Ormazd et Ahriman* (Par. 1877).

Zorn'dorf, a village in Brandenburg, Prussia, 4 miles N. of Küstrin, famous as the scene of a desperate battle in the Seven Years' War between 50,000 Russians under Fermor and 30,000 Prussians under Friedrich the Great, August 15, 1758. The Russians were defeated with a loss of 20,000 men; the victors lost 13,000.

Zos'imus, a Greek, succeeded Innocent I. as Bishop of Rome, A.D. 417. He deserves notice only for the partial countenance he gave to the Pelagian doctrines, as they were expounded to him by their author's disciple, Cœlestius. The council of Carthage, however (418), reaffirmed the unsoundness of Pelagius, and this judgment soon received the hearty assent of Z. His letters on this matter, and on Gaulish affairs, may be found in Coustant's *Epistolæ Romanorum Pontificum* (Par. 1721). Z. died December 26, 418.

Zos'imus, of Constantinople, is supposed to have held office there as advocate to the treasury. He wrote a *History of the Roman Emperors*, from Augustus to 410 A.D. In this work, which, is ably executed, he inveighs bitterly against the Christian emperors, particularly Constantine and Theodosius I. The best edition of Z. is that of Bekker (Bonn, 1837), forming a volume of Niebuhr's *Corpus Scriptorum Historiæ Byzantinæ*. An English translation of the history appeared in 1814 (Military Library).

Zouaves' (Arab. *Zwava*), a body of French infantry, deriving their name from a tribe of Algerian Kabyles, whose fighting men were famous throughout N. Africa for centuries. After the French occupation of Algiers in 1830, a body of these Kabyles, who had been employed as mercenaries by the Dey, were incorporated with the French army and provided with French officers and arms. The Arab dress was preserved, but Frenchmen were distributed among the companies as private soldiers. Subsequently the corps was formed into distinct French and Arab companies, and in 1837 it was divided into three battalions under Lamoricière, to whom, and to General Cavaignac, was due its singular efficiency in the final conquest of Algeria. But long before the French supremacy was complete, it had been found necessary to eliminate the native element from the Zouave corps, and after 1840 the Z. were simply European troops retaining the old name and dress. These troops were the *élite* of the French infantry during the Crimean War, and revived their old reputation in the Italian campaign of 1859. On the reorganisation of the army, under the law of March 13, 1875, the Z. were divided into four regiments, each of four battalions, and containing in all 16,000 men. Three of the regiments are in the 19th army corps in Algeria. They are armed with carbines and short sword-bayonets, and their dress is a loose dark blue jacket and waistcoat and Turkish trousers, red fez with yellow tassel, sky-blue sash, yellow leather leggings, and white gaiters. During the American Civil War a few volunteer regiments took the name and dress of the Z., and militia regiments in the States also bear the name.

Zschokk'e, Johann Heinrich Daniel, German playwright, historian, and novelist, born at Magdeburg, 22d March 1771, studied theology, philosophy, history, and literature at the university of Frankfurt, and acted till 1795 as a *privat-docent* there; travelled over a considerable part of Europe, finally settled as schoolmaster in Switzerland, where he greatly distinguished himself during the revolutionary troubles by his efforts on behalf of his adopted country, was appointed to several high public positions, spent the last years of his life in continuous literary activity, and died at Aarau, 27th June 1848. Z. was a very prolific author. He wrote *Abällino, der Grosse Bandit* (Berl. 1793), a drama of the then popular 'blood and thunder' character, a number of works on the history and forestry of Switzerland, *Stunden der Andacht* (29th ed. Frankf. 1853, new ed. 1873; translation by Burrows, Lond. 1830), a highly popular book of devotion written from a rationalistic standpoint, and a large number of very excellent novels, distinguished by lively humour, considerable powers of description, and clever construction and development of plot. Among these last *Jonathan Frock*, *Die Neujahrsnacht*, and *Das Goldmacherdorf* (Eng. trans. Lond. 1845) deserve special mention. There is an English translation of his *Tales* by Godwin (2 vols. Lond. 1846). See Z.'s *Sämmtliche Schriften* (40 vols. 2d ed. Aarau 1856 and following), and Emil Zschokke's *Z.* (3d ed. Berl. 1876).

Zschop'au, a town of Saxony, government of Zwickau, on the river Z., an affluent of the Mulda, and 26 miles E. of the town of Zwickau. It has a castle built on the top of a rock, and important woollen and cotton manufactures. Pop. (1875) 8045.

Zucc'aro, Federi'go, an Italian painter, born in 1543, was intrusted by Pope Gregory XIII. with the completion of the pictures in the Pauline Chapel, begun by Raphael. Falling into disgrace, however, he went abroad, and spent several years in Flanders, Holland, and England, where he painted portraits, among others, those of Queen Elizabeth and Mary Stuart. In 1582 he was employed in adorning with pictures the palace of the Doge of Venice. He founded the Academy of San-Luca, was called to Spain in 1588 to decorate the Escurial, but soon returned to Italy, where he died in 1609. Both Federigo and his brother Taddeo (born 1529, died 1566), in spite of their artistic merits, are examples of the decadence of Italian art in the latter half of the 16th c., of its lack of originality, genuineness, and power.

Zug, the smallest of the Swiss cantons, lies near the centre of Switzerland, and is bounded on the N. by Zürich, on the W. by Luzern and Aargau, and on the S. and E. by Schwyz. Area, 92 sq. miles; pop. (1877) 21,915, of which only 4 per cent. are Protestant. One-seventh of the canton consists of lake. From the Ægerisee, near the eastern shore of which lies the famous Morgarten pass, the scene of the Austrian defeat in 1315, the river Lorze flows N.W. to the northern extremity of the Zugersee, thence continuing its course northward to the Reuss. The Zugersee is a picturesque lake, 9 miles long and 2 or 3 miles broad, which extends in a N. and S. direction at the base of orchard-clad and beautifully wooded heights of moderate elevation. The highest peak is the Rossberg, which is 6045 feet above the sea-level, and 4445 feet above the lake. The soil throughout the canton is fertile and the climate mild, chestnuts and figs even ripening in the open air. Pasturage is excellent, and cattle, butter, cheese, and condensed milk (manufactured since 1867 at Cham, a village at the north end of the Zugersee) are among the exports. Other exports are honey, dried fruit, cider, cereals, kirschenwasser, and cotton goods. Silk-weaving also forms an important industry, and paper manufactures exist at Baar and Cham. Fish abound in the lakes. See Egli's *Taschenbuch Schweizerischer Geographie, Volkswirthschaft und Kulturgeschichte* (2d ed. 1878).

Zug, the capital of the canton of Z., lies on the N.E. shore of the Zugersee, at the base of the orchard-clad Zugerberg (3251 feet). It has manufactures of kirschenwasser, cider, and paper, and 6 churches, of which the finest are St. Oswald, with a fantastically decorated portal, and St. Michael, standing boldly above the town. There are also a Capuchin and a Franciscan monastery, an arsenal with a collection of weapons of rare historic interest, an hospital, and new government buildings in the Renaissance style. Pop. (1870) 4277.

Zulu' ('heavens'), or **Amazulu** ('people of the heavens'), the leading section of the Kaffir (q. v.) race of S.E. Africa. At the beginning of the present century, the tribe to which the name of Z. more strictly belonged was weak, insignificant, and tributary to the Umtetwa, a powerful tribe occupying the southern portion of what is now known as Zululand (q. v.). Godongwana, a son of the Umtetwa chief, having intrigued against his father, was forced to flee to Cape Town, whence he returned after his father's death, slew his brother, and succeeded him in the sovereignty. This man, henceforward known as Dingiswayo, or 'The Wanderer,' founded among his people a military organisation based upon that which he had seen in Cape Colony, and by means of it speedily conquered the neighbouring tribes. Among the common soldiers in his army was a young man named Utyaka, or Chaka, the illegitimate son of the Z. chief, from whom he had fled to Dingiswayo for refuge. He displayed remarkable military skill and valour, as a reward for which, on his father's death in 1810, Dingiswayo made him chief of the Z. Improving upon the military system of his patron, Chaka entered upon a career of conquest, remaining faithful to Dingiswayo, however, till (about 1818) the latter was captured and killed by a chief whose life he had once spared. Despising the comparatively merciful policy of Dingiswayo, Chaka gave his foes a choice only between submission and extermination, in cases of resistance killing men, women, and children alike, carrying off the cattle and burning the dwellings. In this way he established his sway over the entire region from King George's River, N. of Delagoa Bay, to the St. John's River in Kaffraria, and inland so as to include much of what now forms the Orange River Free State and Transvaal Territory. As a consequence of his conquests, the name Z. ceased to be a merely tribal, and became a national designation. At the same time great changes were wrought in the distribution of the tribes, some of the largest of which were displaced and fled to new regions. Thus the Amafengu, or Fingoes, fled from Natal to Kaffraria, and another large tribe took refuge near the present site of Pretoria (q. v.). The latter, fleeing again from Chaka's successor, eventually settled in the highlands between the Limpopo and Zambesi rivers, and founded the Matebele kingdom of the afterwards notorious king Moselekatse. While still pursuing his victorious career, Chaka was assassinated, September 23, 1828, aged forty-one. As illustrating the bloodthirstiness of his character, it will suffice to mention that, to secure himself on the throne, he ordered all his children to be killed, and with his own hand he stabbed his mother to the heart for sparing one of them alive. He was succeeded by his brother Dingaan, who followed in his footsteps, until in 1838 he came in contact with a new and formidable enemy in the person of the Boers (q. v.), who had come to settle in Natal. By treachery he murdered their leaders, and then surprised and slew the rest of their party to the number of 600 (women and children included), at a place thenceforth known by the name of Weenen, *i.e.*, 'weeping.' Some months later the Boers under Pretorius defeated Dingaan with enormous loss at the Blood River, and in 1840 he died, and was succeeded by his brother Umpande, or Panda. The latter pursued a peaceful policy, and lived on good terms with the British till his death at the end of 1872. In 1854, to settle disputes between his sons Umbulazi and Cetywayo (pron. Ketchwayo) regarding the succession, he allowed them to meet each other in the battlefield, when the former was slain. Cetywayo acted as regent for several years before his father's death, and in 1873 he was formally crowned king by an official representing the Natal Government. He early manifested a desire to imitate his uncles Chaka and Dingaan rather than the peaceful example of his father, but although he perpetrated fearful atrocities upon his subjects, war between him and the British did not break out till January 1879. On the 22d of that month a British camp at Isandhlwana was overpowered by 20,000 Zulus, and 823 Europeans, of whom 49 were officers, besides fully 500 of a native contingent, were killed. Throughout the succeeding night a British post at Rorke's Drift, a few miles distant, was successfully defended against 3000 Zulus by a British force numbering only 139, of whom 17 were killed and 10 wounded, while the Z. loss in killed alone exceeded 350. On March 28th an attack made on the Z. position on the Zlobane Hill by the column on the Transvaal frontier, commanded by Colonel Wood, was repulsed with considerable loss. Next day Colonel Wood's entrenched camp at Kambula Kop was attacked by a Z. force estimated to number 20,000, but after severe fighting the Zulus were routed with a loss reckoned at 2500. On April 2d the main British army under Lord Chelmsford, while advancing to the relief of a British force commanded by Colonel Pearson, which had been beleaguered at Ekowe, in the S.E., since the disaster at Isandhlwana, was attacked at Ginghilova. After a sharp fight of an hour and a half the Zulus were defeated with a loss of 750 killed, the casualties on the British side being very trifling, and Ekowe was relieved next morning. On May 30th, Lieutenant-General Sir Garnet Wolseley, who had just been appointed Governor of Natal and the Transvaal, left England to assume the supreme civil and military command in the disturbed region. On June 1st, Prince Louis Napoleon, only son of the late French Emperor, was 'assegaied' by Zulus near Edutu Kraal, in one of those 'surprises' which have proved a fatal feature of the war. The news excited a profound and sympathetic interest in Europe. Meanwhile Lord Chelmsford had advanced on Ulundi, Cetywayo's great military kraal, with a force of over 5000 men, and on the 4th of July inflicted a crushing defeat on the Z. forces. Cetywayo became a fugitive, and after a long hunt was finally captured on the 28th of August in Ngome Forest by Major Marter of the King's Dragoon Guards. Transported to Cape Town, where he landed on the 14th of September, he still (April 1880) remains a State prisoner in Cape Town Castle. The Z. monarchy and military organisation are completely broken up. In September 1879 Sir Garnet Wolseley parcelled out the country among thirteen chiefs, who undertook to govern their territories in accordance with the regulations prescribed by the High Commissioner, and no difficulty has yet (April 1880) arisen in connection with this new settlement of affairs.

At the present time the Zulus are found not only in Zululand, but in Natal, where many thousands took refuge from the tyranny of their king, as well as in Kaffraria and Cape Colony. The northern Matebele kingdom has been already mentioned, while a Z. tribe, known as the Mazitu or Mangoni, has penetrated still farther N., and now inhabits the tableland bordering on the N.W. shore of Lake Nyassa, between 11° and 12° S. lat. Physically the Zulus are a fine race, being tall, well made, athletic, and exceedingly active. Before the breaking up of Cetywayo's power, his army amounted to 50,000 men. When not at war, the Zulus spend their time in hunting, talking (of which they are fond), singing, dancing, smoking, and drinking. The women do all the field work and build the huts, which are made of sticks covered with straw. Every woman

has a hut to herself. Wives are bought with cows, and the number of a man's wives is only limited by his means. As women are forbidden, under pain of death, to touch cows, the operation of milking these is performed by the men. Like all Kaffirs the Zulus have a great dread of witchcraft, their superstitions in regard to which have been a chief cause of the atrocities so frequent in their country. They also believe that men's souls after death pass into the bodies of snakes, and these reptiles are accordingly regarded with the greatest veneration. In Natal Zulus are employed as servants, porters, &c., but comparatively few of them will work on farms or plantations, or at any occupation involving continuous labour. See Farrer's *Zululand and the Zulus: their History, Beliefs, Customs, Military System, Home Life, Legends, &c., and Missions to them* (Lond. 1879), and Lucas' *The Zulus and the British Frontier* (Lond. 1879); also the *Proceedings of the Royal Geographical Society* for March 1879.

Zulu'land adjoins Natal on the N., and is included between 27° 30'-29° 14' S. lat., and 30° 40'-32° 50' E. long. Its extreme length from N. to S. is 125 miles, its greatest breadth from W. to E. 112 miles, and its area about 10,000 sq. miles. The region lying between the northern extremity of St. Lucia Lake and the Portuguese possessions at Delagoa Bay, though formerly included in Z., is now regarded as a distinct territory, known as Amatongaland. Its inhabitants are less warlike than the Zulus, whom they view with small favour. Z. may be divided, physically, into three districts, running parallel to the coast, and known respectively as Lower, Middle, and Upper Z. The first constitutes the coast district, a strip of low-lying land, from 15 to 20 miles wide, thickly wooded and broken up by swamps and lagoons, which are separated from the sea by a rocky range known as the Berea. Of these lagoons by far the largest is St. Lucia Lake, already mentioned, which is 50 miles long, with an average breadth of 12 miles, but only from 3 to 6 feet deep. This region is very hot, and unhealthy for Europeans, especially from February to May, but possesses a very fertile soil, well suited to the growth of sugar, coffee, rice, cotton, arrowroot, tobacco, &c. *Middle Z.* consists of undulating grassy plains, partially wooded, and crossed by mountain ranges about 3000 feet high, clothed with fine forests, and intersected by *kloofs* or gorges, through which the rivers flow to the sea. This portion of the country is exceedingly beautiful, and enjoys a salubrious climate, while it is well adapted alike for stock-raising and agriculture. *Upper Z.*, between which and Middle Z. there intervenes a mountain range, consists of elevated, broken, and wooded country descending from the great Drakenberg chain of mountains, which are from 20 to 30 miles farther W., and are here about 7000 feet high. Cattle and sheep thrive on the pastures of this region, and wheat grows well. The principal rivers of Z. are the White and Black Umvolosi, which unite near the centre of the country; the Umkusi, Uvulu, Umlalazi, Blood, and Tugela. The last two form the boundary between Z. and Natal. None of the rivers of Z. are navigable, and all are liable to great changes of level. In winter, which is the dry season, they dwindle into mere rivulets, while in summer, heavy thunderstorms in the mountains cause them to swell into foaming torrents, often impassable for weeks. As a rule their banks are clothed with thick bush. Z. is believed to be rich in minerals, and gold has been found not far from the Tugela river, but prospecting being strictly forbidden by the king, no thorough examination of the country, with the object of ascertaining its mineral wealth, has been possible. The capital of Z. is Ulundi, which is beautifully situated in a natural amphitheatre 8 miles in diameter, almost exactly in the centre of the country, and not far from the N. bank of the White Umvolosi river. Smaller villages are numerous, and the total pop. of the country is estimated to be about 300,000. For references see previous article.

Zu'mala-Carr'eguy, Don Tomas, a notable Carlist leader, was born of a royalist family at Ormaiztegua, in the Biscayan province of Guipuzcoa, in 1789. He studied law in the University of Pampeluna, but quitted college for the army at the French invasion in 1808. He served under Mina, was made captain in 1813, and in 1822 commanded two battalions of Quesada's 'Army of Faith' against the upholders of the constitution. When absolute monarchy was re-established in 1823 he became lieutenant-colonel, and governor of Ferrol. For a speech in which he declared that after the death of Ferdinand VII. he would only recognise Carlos V. as king, he was tried by court-martial, without incurring any penalty. In 1832 he was dismissed from the army along with other Carlists; but in October 1833 he raised a body of royalist volunteers in the Basque provinces, and next year he was joined by Carlos. He then gained five great victories, one in the valley of the Amescoas, against Rodil (August 1, 1834), another at Viana (September 7), the third on the plains of Vittoria (October), the fourth a brilliant defeat of Valdes in the valley already mentioned (1835), and the fifth the subjugation of Iriarte at Guernica. While in a career of triumph he besieged Bilboa, and there was mortally wounded by a musket ball June 15, 1835, dying at Cezama ten days later. 'Uncle Tomas,' as his devoted soldiers called him, had sacrificed fortune, family, and a heroic life to a prince unworthy of his allegiance. C. F. Henningsen has published *The most Striking Events of a Twelve Months' Campaign with Z.* (2 vols. Lond. 1826).

Zumpt, Karl Gottlob, a well-known classical philologist, was born at Berlin, March 20, 1792, entered the University of Heidelberg in 1809, studied afterwards at Berlin, and became in 1827 extraordinary and in 1836 ordinary professor of Roman literature at the latter. In 1831 he travelled in Italy and in 1835 in Greece. He died at Karlsbad, June 25, 1849. Z. is best known by his *Lat. Grammatik* (Berl. 1818; 13th ed. 1874). His other works are *Annales Veterum Regnorum et Populorum* (1819; 3d ed. 1842); *Ueber den Röm. Ritterstand* (1839); *Ueber den Stand der Bevölkerung und die Volksvermehrung im Alterthum* (1841); *Ueber den Bestand der Philosophischen Schulen in Athen und die Succession der Scholarchen* (1843); *Ueber die bauliche Einrichtung des Röm. Wohnhauses* (1844, 2d ed. 1851); *Die Religion der Römer* (1845); *Ueber die Persönliche Freiheit des Röm. Bürgers und die Gesetzlichen Garantien derselben* (Darmst. 1846); and his editions of Quintilian (Leip. 1831), Curtius (Berl. 1826), and Cicero's *Orationes in Verrem* (2 vols. 1831), and *De Officiis* (Braunsch. 1838). See his nephew's *De C. Tim. Zumptii Vita et Studiis Narratio* (Berl. 1851).—**August Wilhelm Z.**, nephew of the preceding, was born at Königsberg, December 4, 1815, in 1833 entered the University of Berlin, and became in 1851 professor at the Friedrich-Wilhelm gymnasium there. He died at Berlin, April 23, 1877. His chief works are *Commentationes Epigraphicæ* (2 vols. Berl. 1850-54); *Studia Romana* (1859); *Das Kriminalrecht der Röm. Republik* (2 vols. 1865-69); *Das Geburtsjahr Christi* (Leips. 1869); and *Der Kriminalprozess der Röm. Republik* (Berl. 1871). See Padelletti, *A. W. Z., zur Erinnerung an sein Leben und seine Schriften* (Leip. 1878).

Zunz, Leopold, the Nestor of modern Hebrew scholarship, was born at Detmold, 10th August 1794, and after some years in Wolfenbüttel gymnasium, studied philology at Göttingen and Berlin. Preacher at the New Berlin Synagogue (1820-22) and joint-editor of the *Spener'sche Zeitung* (1824-32), he also directed the Jewish school (1825-29), and, after a visit to Prague (1835), the new Normal Seminary (1839-50). In 1845 he became a member of the Commission for the Education of Jews in Prussia. Among his numerous works are *Etwas über die rabbinische Literatur* (1818), *Die Gottesdienstlichen Vorträge der Juden* (1832), *Die synagogale Poesie des Mittelalters* (1855), *Literaturgeschichte der synagogalen Poesie* (1869), &c., republished in his *Gesammelte Schriften* (3 vols Berl. 1875-76).

Zü'rich, one of the N.E. cantons of Switzerland, is bounded on the W. by Aargau, on the S. by Zug and Schwyz, on the E. by St. Gallen and Thurgau, and on the N. by Schaffhausen and the German state of Baden. Area, 665 sq. miles; pop. (1877) 296,815, of which 18,100 are Catholics, 510 Jews, and the rest Protestants. From the somewhat hilly S.E. district culminating in the Schnebelhorn (4249 feet), the surface slopes down towards the N.W., all its lakes and streams draining ultimately into the Rhine, which here partly forms the boundary between Switzerland and Germany. In the S.W. of the canton, beautifully situated at the base of wood-crested ridges, whose gentle slopes display a choice mingling of orchards, vineyards, meadows, and fields, stretches the crescent-shaped Zürichersee, with a length of 25½ miles, a breadth of never more than 2½ miles, and an area of 34 sq. miles. It is fed by the Linth, and is drained by the Limmat, which after receiving the Sihl from the S. flows N.W. to the Aar, a tributary of the Rhine. Of the thirty kinds of fish which are found in the lake, the pike is the most abundant and the salmon trout most prized. To the E. of the northern

extremity of the Zürichersee lies, at a height of 1700 feet, the Pfäffikersee (area, 1¼ sq. miles), from which the Aa flows W. to the Greifensee (area, 3⅝ sq. miles), and is continued under the name of the Glatt N.W. to the Rhine. The Töss, a sister-stream of the Glatt, and lying to the E. of it, and the Thur, which rises in the mountainous region to the S. of the Bodensee and traverses the extreme N.E. portion of the canton, are the only other streams of any importance. The northern half of Z., forming the southern slopes of the valley of the Rhine, is a gently undulating country with wooded ridges and broad fertile valleys, laid out in pleasant meadows and cultivated fields, and studded over with neat and thriving villages. Agriculture is diligently attended to; wine is produced in considerable quantity along the Limmat valley and the flanking slopes of the Zurichersee and in the so-called *Weinland*, embracing portions of the Töss and Thur valleys; and cattle, swine, goats, horses, and sheep are reared throughout the canton. About 200 sq. miles are under forest, but yet to meet the consumption fuel has to be imported. This great demand arises from the peculiar commercial character of the canton, which is the great manufacturing centre of Middle Europe. The cotton manufacture is the most important industry, employing directly nearly 10,000 hands, while taking into account the numerous establishments for dyeing, printing, dressing, and working embroidery, as many as 40,000 hands find employment. In the silk manufacture, which has flourished for three centuries, 4000 are employed in the factories and 18,000 earn a livelihood. The ironworks and machine manufactures, including bell and type founding, are second to none in Switzerland. Paper, clay-ware, leather, soap, and candles are also manufactured in quantity. The exports are silk, cotton, wool, iron, dyes, corn, salt, wood, wine, brandy, hides, and dairy produce.

Zü'rich (the Roman *Turicum*), capital of the canton of Z., and one of the most active industrial and commercial towns of Switzerland, is beautifully situated in a valley between the Uetliberg and Zürichberg, 42¾ miles N.W. of Glarus by rail, at the N.W. end of the Zürichersee, and on the banks of the Limmat, where it issues from the lake in a broad and rapid stream, to be joined a little below the town by the Sihla, which skirts the W. side of Z. The Limmat is crossed by five bridges, and divides the town into two divisions, the Grosse Stadt on its right, and the Kleine Stadt on its left bank. The principal buildings are the Gross-Münster, in the unadorned Romanesque style of the 11th and 12th centuries; the Gothic Frauenmünster, dating from the 13th c.; the Augustinerkirche, used for 300 years as a magazine, but restored to its original purpose in 1848; St. Peterskirche, of which Lavater was pastor for twenty-three years; the Töchterschule, built (1851) on the site of an ancient chapter-house of the 13th c.; the Rathhaus (1689); the Wasserkirche, built in 1479, restored in 1860, now containing the town-library of 40,000 volumes, many Roman antiquities and rare MSS.; the University, founded in 1832 (in 1878 with 87 instructors and 328 students); and the Federal Polytechnic, founded 1861–64. Z. is the chief seat of the industries of the canton, and the emporium of trade for the E. of Switzerland. It manufactures silks, cotton, paper, and machinery. In the district in 1878 the export of silk amounted to £800,000. Pop. (1870) of the town itself, 21,199, with its suburbs, 56,695. See Bluntschli. *Geschichte der Republik Z.* (2 vols. Zür. 1847–48; vol. iii. by Hottinger, 1856).

Züt'phen, a formerly fortified town of the Netherlands, in the province of Gelderland, at the confluence of the Berkel with the Yssel, 18¼ miles N.E. of Arnhem by rail. It has six churches, including the St. Walpurgiskirche of the 12th c., and a gymnasium, manufactures paper, oil, and cement, and carries on considerable trade in wood, corn, and cattle. Pop. (1876) 14,513. Z. was a town in the 10th c., when it was under its own Grafs. Vassals of the Bishop of Utrecht from 1021, they died out in 1107, whereupon Z. fell to the Grafs of Geldern. In the Dutch War of Independence Z., seized by the Patriot party, was taken in 1572 by Alba, who put to death many of its citizens, and in 1586 Sir Philip Sidney was mortally wounded at a skirmish in the neighbourhood. In 1591 Maurice of Orange gained possession of Z. Taken and dismantled by Philippe Duc d'Orleans in 1672, and again taken without opposition by the French in 1795, it yielded its weak garrison of 300 men on the first appearance of the Prussians, 24th November 1813.

Zuy'der Zee' (Dut. 'South Sea'), the largest gulf of the North Sea, on the coast of Holland, is bounded on the E., S., and W. by the provinces North Holland, Utrecht, Gelderland, Overyssel, and Friesland, and separated from the North Sea by the islands Ameland, Terschelling, Vlieland, and Texel. Length, 80 miles; greatest breadth, 40 miles; area, 1365 sq. miles. Within the Z. Z. are the islands Wieringen, Schokland, Urk, and Marken. The Z. Z. receives on the E. the Yssel and on the S. the Amstel, both branches of the Rhine, the latter of which flows into the Ij or Y, a narrow arm of the Z. Z. extending from its S.W. corner, and, with the extension of the Wijkermeer, stretching to the 'neck of Holland,' 4 miles across (see NETHERLANDS). The Z. Z. fisheries in 1875 employed 1282 boats, manned by 3269 men, in the capture of plaice, herrings (24,500,000 caught from October to April), and anchovies (2701 tons, caught chiefly in May and June, and sold for £103,125). The quantity of salted anchovies exported from the Z. Z. in the same year was 1323 tons (56 per cent. to Germany, 8 per cent. to England). The Z. Z. was in early times a lake, called *Flevo* in the Roman period, at a later time *Middelsee*, but from the beginning of the 13th c. to the great flood of 1247 its N.W. shore was gradually engulfed by the sea. The depth of the Z. Z. at its mouth is only 10⅝ feet, and its general depth is 3½ to 26 feet. The part of the Z. Z. south of the islands of Urk and Schokland has an average depth of only 10 feet. The Dutch Government has projected the draining of this part, in area 487,000 acres, an undertaking estimated to occupy twelve to sixteen years, and to cost £10,000,000. It is proposed to build a dyke from Enkhuizen to the mouth of the Yssel, a distance of 28 miles, along the S. side of which powerful steam-pumps will discharge the water from a wide drainage receptacle into the Z. Z., and then to construct a main navigation canal ('Boezem Kanaal') from the Orange locks of the North Sea Canal to the *Ven*, a point 3 miles N. of Enkhuizen, where a harbour will be established that shall be the outport of Amsterdam to the ports of Northern Europe. See *The Z. Z. Reclamation*, in *Engineering* for September 1870; *Revue des Deux Mondes* (November 1875); and Henri Havard, *La Hollande Pittoresque: Voyage aux Villes Mortes au Zuiderzée* (Par. 1875; Eng. trans. 1875).

Zvenigorod'ka, a town of European Russia, in the government of Kiev, on the river Tikitch, 96 miles S.S.E. of the town of Kiev, has numerous sulphur springs in its neighbourhood. Pop. (1870) 11,375.

Zvor'nik, a town of Bosnia, Turkey, on the Drina, 68 miles N.E. of Serajevo. The inhabitants are partly Servian, partly Catholic, and to some extent Mohammedan. The coal and lead mines are rich though undeveloped. Z., which is a fortress of great strength, was occupied by the Russians, 2, in September 1878. Pop. 10,000.

Zwei'brücken (Fr. *Deux-Ponts*), a town of Rhenish Bavaria on the Erbach, here crossed by two bridges, 7 miles S. of Homburg and 35 W. of Landau by rail. It has a Protestant cathedral (1497), an old castle used as a court of justice, and a newly-erected prison. Pop. (1875) 9248. Z. was long the residence of the Dukes of Deux-Ponts or the Z. Palatinate, and here from 1779 were published the well-known *Bipontine Classics*. See Butters' *Ueber die Bipontiner und die Editiones Bipontinæ* (Zweib. 1878).

Zwick'au, a town of Saxony, on the Mulde, 80 miles W.S.W. of Dresden by rail. Its chief buildings are the Gothic Marienkirche (1451; restored 1840), with paintings by Wohlgemuth, an interesting Rathhaus and Exchange of the 16th c., a quondam castle (1581–90), a gymnasium with library, &c. Coal and iron are extensively worked in the neighbourhood; but Z. has also chemical works, saw-mills, tanneries, cotton, and woollen mills. Pop. (1875) 31,491. Z. is first mentioned in 1118, obtained municipal rights in 1212, and until the 17th c. was one of the greatest industrial towns in Saxony. In 1521 it received the Reformation, and became the scene of great Anabaptist struggles. See Herzog's *Chronik der Kreisstadt Z.* (Zwic. 1845), and his *Geschichte des Zwickauer Stein Kohlenbaues* (Dresd. 1852).

Zwing'li, Ulrich, or Huldereich, the famous Swiss reformer, was born January 1, 1484, at Wildhaus, a mountain village of the Toggenburg, the third of the eight sons of the Amtmann of

that place. After a six years' course at the schools of Basel and Bern, he studied philosophy at Vienna, 1499–1501, and theology under Wyttenbach at Basel, 1502–6. He was appointed pastor at Glarus in 1506, and here he devoted himself in his newly-founded Latin school to the education of the young with an ardour that called forth the praises of Erasmus, and drew around him a circle of enthusiastic pupils, one of whom was the patriotic historian Ægidius Tschudi. At the same time he studied the Latin classics and fathers, and in 1513 commenced the study of Greek, writing down the epistles of Paul in the original, and committing them to memory. In 1513, and again in 1515, as army chaplain, he accompanied the Glarus contingent of the army raised in Switzerland to drive the French out of Lombardy, and gave striking evidence of his personal courage on the disastrous field of Marignano (September 14th and 15th, 1515). For his services he received until 1517 a pension from the Pope of fifty crowns, ostensibly granted to assist him in purchasing books to pursue his studies. On his return Z. wrote a strong remonstrance to several of the cantonal governments against the prevailing practice of foreign enlistment. As his knowledge of the Scriptures and the fathers extended, he found himself drifting farther and farther from the received traditions of the Church. In 1516 he was called by Diebold von Geroldseck to be preacher to the monastery of Maria-Einsiedeln, the most frequented place of resort for the pilgrims of S. Germany, Switzerland, and the E. of France, and here he preached with great boldness the inefficacy of pilgrimages and formal devotions, and proclaimed the Scriptures to be the only safe rule in matters of faith. At the same time he implored his bishop, Hugo of Constance, as well as Cardinal Schinner, to aid in reforming discipline and restoring the Church to its ancient purity. In December 1518 he was called to the cathedral at Zürich, by the votes of 17 of the 24 canons. Here, as at Einsiedeln, Z. fiercely opposed Bernhardin Sampson, the vendor of indulgences, and succeeded in preventing his entrance into the town. He now devoted himself to pastoral work with apostolic zeal, and preached the new doctrines with such success that on January 29, 1523, the Great Council of Zürich held a public conference for the free discussion of the points at issue. Here Z.'s unrivalled power of debate enabled him to overthrow his opponents, the ablest of whom was Johann Faber, the vicar-general of Bishop Hugo, and afterwards Bishop of Vienna; and the Great Council came to a resolution that Z. should continue to preach as before, and that the pastors of the town and territory of Zürich should base their discourses on the Scriptures alone. At a second conference, held October 26–29 of the same year, Z. argued before 900 persons against the worship of images and the mass, and the consequence was the removal of all images from the churches of Z. A third conference, on January 13 and 14, 1524, resulted in the abolition of the mass. In the same year Z. married Anna Meyer (*née* Reinhard), a widow of forty-three. He now became almost temporal and spiritual dictator of Zürich, reorganised the whole system of public instruction, brought marriages under the civil courts, and diverted the surplus revenues of the religious houses to founding hospitals and schools; but in no case, unlike almost all other countries, did the secularisation of Church property lead to its being swallowed by the State or embezzled by powerful individuals. New troubles soon arose with the fanatical Anabaptists, and Z. held several conferences with them, without, however, convincing them of the impracticability of their schemes, nor were they silenced until severe measures were resorted to by the Government. Z. was not allowed by the Council of Zürich to attend the conference held at Baden in Aargau in 1526, but he attended the nineteen days' conference which commenced January 6, 1528, at Bern, and as it had been granted that no argument should be used not founded on a text of Scripture, he won a brilliant victory and brought over the canton of Bern to the Reformation. In September 1528 Z. repaired with Æcolampadius to Marburg, to hold a conference with Luther and Melancthon, which had been organised by Philip of Hesse. After three days of eager and sometimes intemperate debate, the conference was broken up, fourteen articles having been agreed upon and signed, but unable to come to an agreement upon the Eucharist, Z. contending that the 'outward symbols of the blood and body of Christ undergo no supernatural change in the Eucharist.' In the year 1531, after much angry controversy, the five cantons of Lüzern, Zug, Schwytz, Uri, and Unterwalden declared war on Bern and Zürich, and invaded the territory of the latter nearly 8000 strong. Zürich, taken at a disadvantage, could only send 2000 men, and Z. was commanded by the Great Council to carry to the field the great banner of the Republic, which had ever been borne in battle by a priest. The Zürichers were terribly defeated in the unequal struggle, and Z. received his death wound on the field of battle while stooping to relieve a wounded soldier at Cappel (q. v.), October 11, 1531. His *Sämmtliche Werke* were published first in folio (Zür. 1545 and 1581; last ed. by Schuler and Schulthess, 8 vols. Zür. 1828–42, supplement, 1861). See Hottinger, *Z. und seine Zeit* (Zür. 1842; Eng. trans. Harrisburg, U.S., 1856); Spörri, *Z. Studien* (Leip. 1866), and the biographies by Christoffel (1857; Eng. trans. Edin. 1858) and Mörikofer (2 vols. Leip. 1867–69).

Zwoll'e, the capital of the Dutch province of Overyssel on the Zwarte ('Black') Water, 25 miles N. of Zütphen by rail, was once a strong fortress with eleven bastions and three forts. It is a handsome, well-built city, with three fine suburbs. Its corn-market is one of the best in Holland. Its chief buildings are St. Michael's Church, a large and splendid building with a famous organ, the government buildings with the provincial archives, the town-hall, and the courts of justice. The town has a Latin school, a school of navigation, an industrial school, a public library with rare works on geography and local history, a museum of natural history, a theatre, &c. Z. has communication with the sea by means of the Willemsvaart Canal. It manufactures oil, spirits, iron goods, and linen, carries on shipbuilding, and a trade in corn and cattle. In a monastery in the neighbourhood Thomas à Kempis lived and died. Pop. (1878) 21,886. Z. was a member of the Hanseatic League.

Zygodac'tyla, a term in zoology denoting the *Suidæ* or Swine, in which the foot is formed of two toes of equal size and of two other toes which do not reach the ground. The term is also applied to those birds (*e.g.*, Scansores, parrots, woodpeckers, &c.) in which the toes are placed two in front and two behind.

Zygophylla'ceæ is a natural order of polypetalous dicotyledons consisting of 17 genera and upwards of 100 species of shrubs or herbs with more or less jointed stems, flowers on axillary peduncles, and generally white, red, or yellow, sepals and petals mostly five, and a dry fruit often separating into cocci. The species are widely dispersed over the tropical and sub-tropical zones, a few also occurring in temperate climates. In the type genus, *Zygophyllum*, the leaves are opposite and consist of two leaflets (Gr. *zugon*, 'a yoke,' and *phyllon*, 'a leaf'). *Z. fabago* has vermifuge properties and its flower buds serve as a substitute for capers. *Z. coccineum* has aromatic seeds employed by the Arabs in place of pepper. The wood called *lignum vitæ* is the most important product of the order. See GUAIACUM.

Zylog'raphy, or **Xylog'raphy**. A new process of printing designs on wood which is applicable to the decoration of panelling, skirtings, mantel-shelves, furniture, &c. Invented by Mr. T. Whitburn and perfected by Mr. Maurice Young, this process is the basis of a new British art manufacture which has been established at Godalming, Surrey. The *modus operandi* is as follows:—An arabesque or floral design is drawn and engraved on a wood block, and from it an electrotype is taken, which is employed to print on thin slabs of soft pine wood. The electrotype is coated with ink, and placed face downwards on the wood to be printed, and a regulated pressure is then applied in an ordinary hand-press. Highly artistic results are thus obtained at a trifling cost. The inks are dark brown and black in colour, and are specially prepared for the process.

Zymot'ic Disea'ses (from Gr. *zymē*, 'a ferment') are, according to Dr. Farr's classification, diseases that are either epidemic, endemic, communicable, inoculable, capable of propagation from existing foci, or of generation; induced by a specific material, which may be named a *poison*, or by want of food, or by its bad quality. Z. D. are arranged into four orders, viz., Miasmatic, Enthetic, Dietic, and Parasitic.

The *Miasmatic* order includes the following diseases, viz., small-pox, measles, scarlatina, diphtheria, quinsy, croup, hooping-cough, typhus, enteric, relapsing, and simple continued fever, erysipelas, puerperal fever, carbuncle, influenza, dysentery, diarrhœa, cholera, ague, remittent fever, rheumatism, &c. The *Enthetic* order comprehends syphilis, hydrophobia, glanders, &c. The *Dietic* order includes privation, purpura, and scurvy, alco-

halism, &c. The *Parasitic* order comprises such diseases as thrush, worms, &c.

By far the most important of the Z. D. are the *acute infectious diseases*, such as small-pox, enteric fever, relapsing fever, typhus fever, cholera, plague, yellow fever, dysentery, diphtheria, measles, scarlatina, hooping-cough, erysipelas, puerperal fever, cerebro-spinal fever, &c. When more precise knowledge regarding the intimate pathology of these diseases has been acquired, it is probable that they will admit, like different species of plants and animals, of a more or less strict philosophical classification; but they all possess, in common, certain well-marked characteristics. They originate through the infection of the system with certain poisonous matters, which are mainly distinguished as ordinary poisons by the fact that they can reproduce themselves under favouring conditions to an endless degree. They are endemic when they are limited to a certain territorial district, and epidemic when they appear at intervals and then again disappear; but each endemic or epidemic disease is not necessarily infectious. The mortality from infectious diseases forms a very large portion of the total mortality. The term zymotic disease applied to the infectious diseases is derived from a theory regarding the origin and mode of propagation of such diseases; for among chemical actions it is chiefly the processes of fermentation and decomposition, which by their capacity for extension, by means of which the smallest possible quantity of matter show the most striking analogy to the contagious diseases. The hypothesis, however, of a *contagium vivum* is consistent with those ferment processes, for both are associated with the presence and multiplication of low organisms; and the existence of disease poisons which have the property of indefinite multiplication necessarily gives rise to the theory of a *contagium vivum*. In the great majority of infectious diseases, the existence of organised disease poisons has not been demonstrated by actual observation; but several diseases which were formerly regarded as simply infectious are now classed among the *parasitic* diseases owing to the demonstration of low organisms sufficient to account for the phenomena of the diseases. One marked peculiarity of the infectious diseases, which they have in common with the poisons proper, is their specificness, so that always and under all circumstances a given disease is solely due to a given kind of morbid agent or cause; or, in other words, each disease breeds true. In diseases of this class the predisposing cause is to be considered only in so far as there may be a question of special susceptibility, and in so far as it may determine the severity of the disease; but the disease itself is entirely independent of it. No individual or external influence decides the nature of the affection, and one infectious disease is never changed into another. From the specificness of infectious diseases it is inferred that there is a continued propagation of the disease poison, and that they never originate spontaneously or *de novo*; but this conclusion is not generally accepted. Another peculiarity belonging to many but not to all infectious diseases, consists in the fact that a single attack of the disease successfully surmounted confers an absolute or relative immunity from it for a certain time, or even for the remainder of life; and it is probable that during the disease there is a destruction or change in the body of some of its constituents necessary for the development of the disease poison.

The important facts in connection with the entire class of Z. D. are that they depend upon causes external to the human frame; that these causes are distinctly preventible; and that the recent advances in sanitary science are sufficient to enable the community to aim, with a reasonable hope of success, at the total extermination of Z. D.

THE END.